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THE
SEXUAL LIFE OF WOMAN
IN ITS
PHYSIOLOGICAL, PATHOLOGICAL
AND HYGIENIC ASPECTS

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ONLY AUTHORIZED TRANSLATION INTO THE ENGLISH LANGUAGE FROM
THE GERMAN BY

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WITH 97 ILLUSTRATIONS IN THE TEXT



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PREFACE.

The sexual life of woman — the appearance of the first indications of sexual activity, the development of that activity and its culmination in sexual maturity, the decline of that activity and its ultimate extinction in sexual death — the entire process of the most perfect work of natural creation — has throughout all ages kindled the inspiration of poets, aroused the enthusiasm of artists, and supplied thinkers with inexhaustible material for reflection.

In the following pages, this sexual life of woman will be considered both in relation to the female genital organs, and in relation to the feminine organism as a whole; in relation both to the physical and to the mental development of the individual; and in relation alike to the state of health and to the processes of disease. Thus from the standpoint of clinical investigation and of practical experience, the book will be a contribution towards the solution of the sexual problem, nowadays recognized as one of supreme importance.

It is thirty years since I published a work on the histological changes that occur in the ovaries during the climacteric period (*Archiv. für Gynecologie*, Vol. xii, Section 3); and ever since that time, the influence exerted upon the general health of women by the physiological and pathological processes occurring in their reproductive organs, has been to me a favourite subject for observation and experiment. The result of these studies is incorporated in my monographs, "The Climacteric Period in Women" (Erlangen, 1874), "Sterility in Women" (2nd Ed., Vienna, 1895), "The Uterus and the Heart" (Leipzig, 1898), and in various contributions to medical periodicals. I now have a welcome opportunity of drawing a general picture of sexual activity in women, and of illuminating this picture both by the light of my own experience and by numerous references to the works of other authors. In passing, I have devoted considerable attention to questions of education and personal hygiene, both of which are greatly influenced by the processes of the sexual life. Thus, I hope, the work will be rendered more interesting to the physician, and the general picture it is intended to convey will be more fully characterized by contemporary actuality.

Natural divisions of the subject are, I consider, furnished by the three great landmarks of the sexual life of woman: the onset of menstruation — the *menarche*: the *culmination* of sexual activity —

the *menacme*; and the *cessation* of menstruation — the *menopause*. These several sexual epochs are differentiated by characteristic anatomical states of the reproductive organs, by the external configuration of the feminine body, by functional effects throughout the entire organism, and, finally, by pathological disturbances of the normal vital processes.

Thus in separate chapters a description is given of sexual processes, a detailed exposition of which will be vainly sought in the textbooks of gynecology, yet which are none the less of far-reaching importance in relation to the physical, mental, and social well-being of women, and in relation also to the development of human society; such topics are, the sexual impulse, copulation, fertility, sterility, the employment of means for the prevention of conception, the determination of sex, sexual hygiene. To the topics of pregnancy, parturition, lying-in, and lactation, since these are adequately discussed in works on midwifery, but little space has here been allotted.

It is my earnest hope that physicians and biologists may derive benefit from the book equal in amount to the pleasure I have gained in the work of writing it.

E. HEINRICH KISCH.

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THE SEXUAL LIFE OF WOMAN.

By the *sexual life of woman* we understand the reciprocal action between the physiological functions and pathological states of the female genital organs on the one hand and the entire female organism in its physical and mental relations on the other; and the object of this book is to give a complete account of the influence exercised by the reproductive organs, during the time of their development, their maturity, and their involution, on the life history of woman.

From the earliest days of the medical art this sexual life of woman has aroused in the leaders of medical thought the highest interest, and for this reason great attention has been directed, not only to the anatomy of the genital organs and to the diseases of the reproductive system, but also to the individual manifestations of sexual activity and to the influence exercised by these on the female organism as a whole.

Several works by *Hippocrates* are extant on this subject, among which may be mentioned: *περι Γυναικείης Φυσεως*,¹ a treatise on the physiology and pathology of woman; *περι Αφωρων*,² which discusses sterility in women; *περι παρθενων*,³ a treatise on the pathological states of virgins. These writings of *Hippocrates* contain some very remarkable observations on the influence exercised by disorders of the reproductive organs on the general health of women.

Aristotle wrote at some length on the functions of the female genital organs. In the writings of *Aretæus* and *Galen* on the diseases of women we find striking observations, as for instance, in *Galen's De Locis Affectis*,⁴ which contains a "Statement of the Similarity and Dissimilarity of Man and Woman." Another notable work is that of *Albertus Magnus*, entitled *De Secretis Mulierum*.⁵

The numerous works on the diseases of women published in the sixteenth century consisted for the most part of a repetition of the observations of ancient writers. The gynecological treatises of the

¹ Concerning the Feminine Constitution.

² Concerning the Barren.

³ Concerning Virgins.

⁴ On the Diseases of Regions.

⁵ On the Secret Parts of Women.

eighteenth century, however, bore witness to an increased knowledge of the anatomy of the female reproductive organs, and were illumined by *Haller's* researches on the functions of these organs.

The subject with which we are especially concerned is discussed in a work by *Boireau-Laffecteur*, *Essai sur les Maladies Physiques et Morales des femmes*,⁶ Paris, 1793; and also in *Marie-Clement's* *Considérations Physiologiques sur les Diverses Epoques de la Vie des Femmes*,⁷ Paris 1803. In the same connection we must mention *von Humboldt's* treatise, *Ueber den Geschlechtsunterschied und dessen Einfluss auf die organische Natur*.⁸ The first comprehensive work in which an exhaustive inquiry was made into the functional disorders of the female genital organs and the relation of these disorders to the female organism as a whole and to the physical and mental peculiarities of woman was *Busch's: Das Geschlechtsleben des Weibes*,⁹ Leipzig, 1839.

In the second half of the nineteenth century a very large number of monographs were published, investigating and describing the reflex disturbances produced alike in the individual organs and in the nervous system as a whole by changes in the uterus and its annexa. Many of these works will be mentioned more particularly in the course of this treatise.

The sexual life, based upon the purpose, so important to every creature, of the propagation of the species, possesses in the female sex a vital significance enormously greater than sexual activity possesses in the male. From the very beginning of sexuality, when the idea of a bisexual differentiation dawns for the first time in the brain of the little girl, down to the sexual death of the withered matron, who laments the loss of her sexual potency, physical and mental activity, work and thought, function and sensation, arise for the most part, wittingly or unwittingly, from that germinal energy which is the manifestation of the unalterable law that the existing organism endeavors to reproduce its kind.

Every phase of the sexual life of woman, from the threshold of puberty to the extinction of sexual activity, the first appearance of menstruation, the complete development of the sexual organs, the act of copulation, conception, pregnancy, parturition, and the puerperium, finally the involutionary process which accompanies the cessation of menstruation at the climateric period — every one of

⁶ Essay on the Physical and Mental Diseases of Women.

⁷ Physiological Considerations on the Diverse Epochs of the Life of Woman.

⁸ Concerning Sexual Differentiation, and Its Influence on Organic Nature.

⁹ The Sexual Life of Woman.

these sexual phases entails consecutive physiological processes and pathological changes alike in the individual organs and in the nutritive condition of the entire organism, in the functions of the cardio-vascular apparatus, of the brain and the nerves, of the skin and the sense-organs, in the processes of digestion and general metabolism. Herein we see a striking illustration of the old saying of *von Helmont*, *propter solum uterum mulier est quod est*,¹⁰ also of the similar aphorism of *Hippocrates*, *uterus omnium causa morborum qui mulieres infestant*;¹¹ a conception summed up by *Goethe* in the words of *Mephistopheles*:

"Es ist ihr ewig Weh und Ach
So tausendfach
Aus einem Punkte zu kurieren."

Just as in a tree the process of growth is made manifest to the superficial observer by the pleasure he feels at the sight of the buds and blossoms, by the refreshment he obtains from the fruit, and by the sadness which the withering of the leaves causes him, so in the sexual life of woman there are landmarks which no one can possibly overlook, by means of which three great epochs are distinguished. These are: puberty (the *menarche*), recognized by the first appearance of menstruation and the awakening of the sexual impulse; sexual maturity (the *menacme*), in the fully developed woman, characterized by the functions of copulation and reproduction; and sexual involution (the *menopause*), in which we see the gradual decline and ultimate extinction of sexual power and all its manifestations. In all these three epochs the sexual life of woman not only affects the hidden domain of the genital organs, but controls also all the vegetative, physical, and mental processes of the body, and is clearly and incontestably apparent in all vital manifestations. What *Madame de Staël* said of love is indeed true of the entire sexual life of woman: *l'amour n'est qu'une épisode de la vie de l'homme; c'est l'histoire tout entière de la femme*.¹²

The sexual life of woman is coëxtensive with the peculiar vital activity of the female sex, for it endures from the moment when

¹⁰ On account of the womb alone is woman what she is.

¹¹ The womb is the cause of all the diseases from which women suffer.

¹² "Love is an episode merely in the life of man; of woman, it is the entire history." But this epigram of *Madame de Staël's* will, to English readers, be more familiar in the form in which it was cast by *Byron* (*Don Juan*, canto i, stanza 194):

"Man's love is of man's life a thing apart;
'Tis woman's whole existence."

individuality first begins to develop out of the indifferent stage of childhood until the decline into the dead-level of senility.

To illustrate this fact, I have drawn up a curve of the sexual life of woman, making use of the statistical data available in central Europe regarding the age at which menstruation first appears, the age at which maidens marry, the age at which the largest number of women give birth to a child, and the age at which menstruation ceases; and reducing the figures to averages. * denotes the fifteenth year of life, as the average age at the menarche; ** denotes the twenty-second year of life as the average age at marriage; *** denotes the thirty-second year of life, in which woman exhibits her maximum fecundity; **** denotes the forty-sixth year of life as the average age at the menopause. (FIG. 1.)

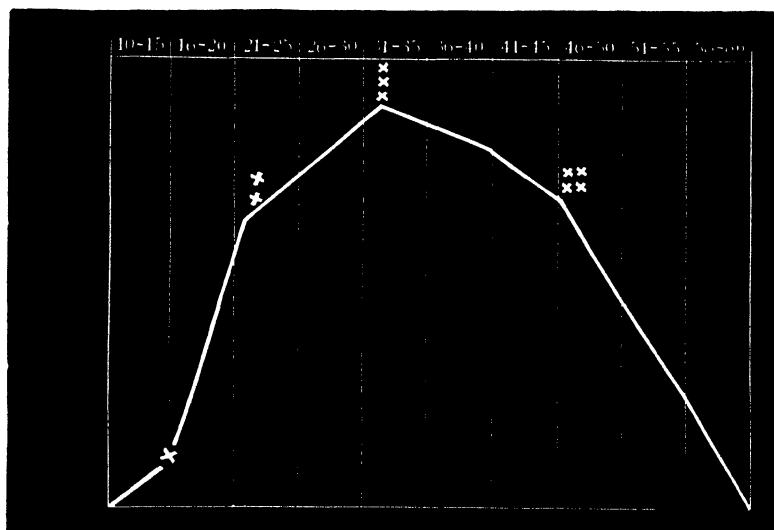


FIG. 1.— Curve of the sexual life of woman from the tenth to the sixtieth year of life.

Not in this respect alone, however, is the sexual life of woman of paramount importance; it is, in addition, the mainspring of the well-being and progress of the family, of the nation, of the entire human race. In the evolution of man from the primitive state in which he existed merely for the performance of vegetative functions up to the highest stage of contemporary culture, in the history of all races and of all times, the sexual life has been a most

potent determining factor. With that life, religion, philosophy, ethics, natural science, and hygiene, have been most intimately related; for that life, they have furnished precepts and laws. The history of the sexual life is identical with the history of human culture.

In a primitive condition of society, among people living in a state of nature and among the lower races of mankind, the sexual life of woman possesses no great general interest, the female being merely a chattel; the ownership of this chattel, moreover, being often temporary and transient. The investigations of anthropologists have shown that among primitive people this form of property is neither highly esteemed nor carefully safeguarded. In such societies no restraint is imposed on the sexual impulse, which is gratified without shame and without formality. No hindrance is offered to the mutual intercourse of the two sexes. Chastity in the females is not prized by the males, nor do the latter compete for the favors of the former. Procreation is no more than a gregarious impulse of the masses among whom the common ownership of all booty is a matter of tribal custom. The woman has no disposing power over that which every one desires and which every one has the right to demand. Very gradually, however, a change takes place in this respect, so that in every period of social life since the very earliest, the modesty of young girls, the high valuation put upon the preservation of virginity, the ethical approbation of chastity in the wife, respect for the duties and rights of the mother, the reverence felt for the matron—all these, throughout the sexual life of woman, have had a civilizing, ennobling, and elevating effect. Thus, as family life has become developed, and as love and marriage have been more highly esteemed, woman has become the much-prized embodiment of all that is beautiful and good, of all that is summed up in the idea of the "housewife," and her sexual life has been more completely, more ideally admired. The danger is not remote, however, that the leveling tendencies of the present day, and an inclination to despise the sexual life of woman, far from resulting in a further elevation of the social status of womanhood, will result rather in its abasement.

The Bible, as we may expect from the patriarchal relationships of the women of that time, bears witness to the worth of woman, and, whilst esteeming childbearing, refers to yet higher duties. Precise religious and social precepts are furnished for all the phases of sexual life.

In classical antiquity, also, we see that woman rose to some extent above the low position she had previously occupied in the family circle and in society at large. Both among the Greeks and among the Romans, there was open to women a more intimate place in social life and a more influential rôle in the life of the family, than would have been their portion regarded merely in relation to their childbearing activity. Amongst the Germans in the very earliest times, chastity gave rise to purer and more moral sexual relations; whereas among the Slavonic peoples the conception of woman as the childbearer continued to dominate these relations.

In consequence of the diffusion of Christianity, woman became man's companion and equal, and her life, the sexual life included, acquired a deeper significance, owing to the stress which that religion laid on chastity as a virtue, and as a result of the educational influence of woman in the family circle.

With the progress of civilization the sexual life of woman comes to exhibit its activities only within the bounds of morality and law, which in human society have replaced the crude rule of nature, and have supplied regulations adapted to the changing phases of sexual vital manifestations. The wise adaptation of these regulations requires, however, a full understanding of the mental and physical processes, an exact recognition of the bodily states and intellectual sensibilities, of woman regarded as a sexual being.

Modern culture and the social organization of the present day, in association with the resulting sexual neuropathy of women, have exercised on their sexual life an influence as powerful as it is unfavorable, manifesting itself in the overpowering frequency of the diseases of women. In one of the most thoughtful books ever written on the subject of woman, *Michelet's L'Amour*,¹³ the author remarks that every century is characterized by the prevalence of certain diseases: thus, in the thirteenth century, leprosy was the dominant disease; the fourteenth century was devastated by bubonic plague, then known as the black death; the sixteenth century witnessed the appearance of syphilis; finally, as regards the nineteenth century, "*se siècle sera nommé celui des maladies de la matrice*."¹⁴ It is certain that the education and mode of life of the modern woman belonging to the so-called upper classes are, as far as sexual matters are concerned, in direct opposition to those that are agreeable to nature and those that the laws of health demand.

¹³ On Love.

¹⁴ "This century will be known as the century of the diseases of the uterus."

Even before sexual development begins, before the physical ripening of the reproductive organs to functional activity, the imagination of young girls is often prematurely occupied with sexual ideas in consequence of unsuitable literature, owing to visits to theatres and exhibitions, or on account of social intercourse with young men who are not overscrupulous in the selection of topics for conversation. From the time of puberty up to the time of marriage the growing woman is under the influence of the now awakened sexual impulse, which experiences ever-renewed stimulation. A sedentary mode of life, unsuitable nutriment, and the early enjoyment of alcoholic beverages, exhibit their inevitable result in the frequency with which, in this epoch of the sexual life, chlorotic blood-changes, neurasthenic conditions, and diverse symptoms of irritation of the genital organs, make their appearance. Thus, when marriage, so often unduly postponed in consequence of the condition of modern society, does at length take place, it is apt to find the woman not only fully enlightened as regards sexual matters, but often in a state of nervous weakness from sexual stimulation, one of the type whose characteristics have been happily summed up by the French writer *Prévost* in the expression *demi-vierge*.¹⁵ The conjunction of this state of affairs in the bride with the frequent partial impotence of the bridegroom, who has already dissipated the greater part of his virile power before entering upon marriage, leads often to the appearance of vaginismus and other sexual neuroses in young married women. Even more disastrous in its consequences as regards the future sexual life of the wife is the ever-increasing frequency of gonorrhoeal infection in the first days of marital intercourse, with all the evil results of that infection. On the other hand, an ever-larger proportion of girls belonging to the "middle and upper classes," abstaining alike from the good and the evil results of marriage, falls under the yoke of sexual impulses denied satisfaction or gratified by abnormal means, and suffers in consequence both physically and mentally. Further sources of injury arising from the conditions of modern social life are to be found in the neglect by women of the well-to-do classes of the duty of suckling their children, and in the ever-increasing frequency with which the women of these classes, after giving birth to one or two children, resort to the use of measures for the prevention of pregnancy, which result in serious consequences as regards both the nervous system and the genital organs of the women concerned. Thus there comes an accelerated ebb in the sexual life, leading to a premature appearance

¹⁵ Half-virgin.

of the general phenomena of senility, with a cessation of the menstrual flow. The modern wife, who claims the right to lead the life that best pleases her, will be more rapidly overtaken by sexual death.

For the elucidation of the manifold reflex and other processes which are dependent upon or accompany the sexual phases of woman, we must in the first place consider the anatomical changes and physiological functions of the female reproductive organs characteristic of the several periods of sexual life which have already been distinguished. We must not fail also to take into consideration the mental states which accompany and characterize these respective phases.

The anatomical changes which occur in the female genital organs during these different phases of sexual life give rise to a number of manifold local stimuli, increasing and decreasing, varying greatly in intensity and area of distribution, upon which depend the reflex effects and remote manifestations in the sphere of the nervous and circulatory systems.

We must first consider the changes in the ovaries, which play an etiologically important part. At the onset of puberty, the follicular masses of the ovary exhibit a more active growth, the follicles increase in size, with their contained ova they approach the surface, and finally, by the bursting of the follicles, the ova are extruded. Then, in the life-phase in which conception occurs, and under the influence of the hyperæmia of all the pelvic viscera that accompanies this process, a notable development of the corpus luteum takes place, this latter body reaching its maximum size in the eleventh week of pregnancy, subsequently undergoing involution and leading to the formation of a considerable scar. Finally, in the critical period of life in which the menstrual flow ceases, a continually increasing growth and new formation of connective tissue-stroma takes place in the ovaries at the expense of their cellular constituents, and a regressive metamorphosis of the graafian follicles occurs.

In association with these sexual processes there ensues a series of striking changes in the shape and consistency of the ovaries, affecting both the surface and the parenchyma of these organs, and capable of stimulating the nervous ramifications in their tissue. In this connection it is worthy of note that the branches supplying the ovaries from the spermatic plexuses of the sympathetic contain a considerable proportion of sensory fibres.

Quite as significant, moreover, as the changes in the ovaries, are those which, in the course of the sexual life, the uterus undergoes,

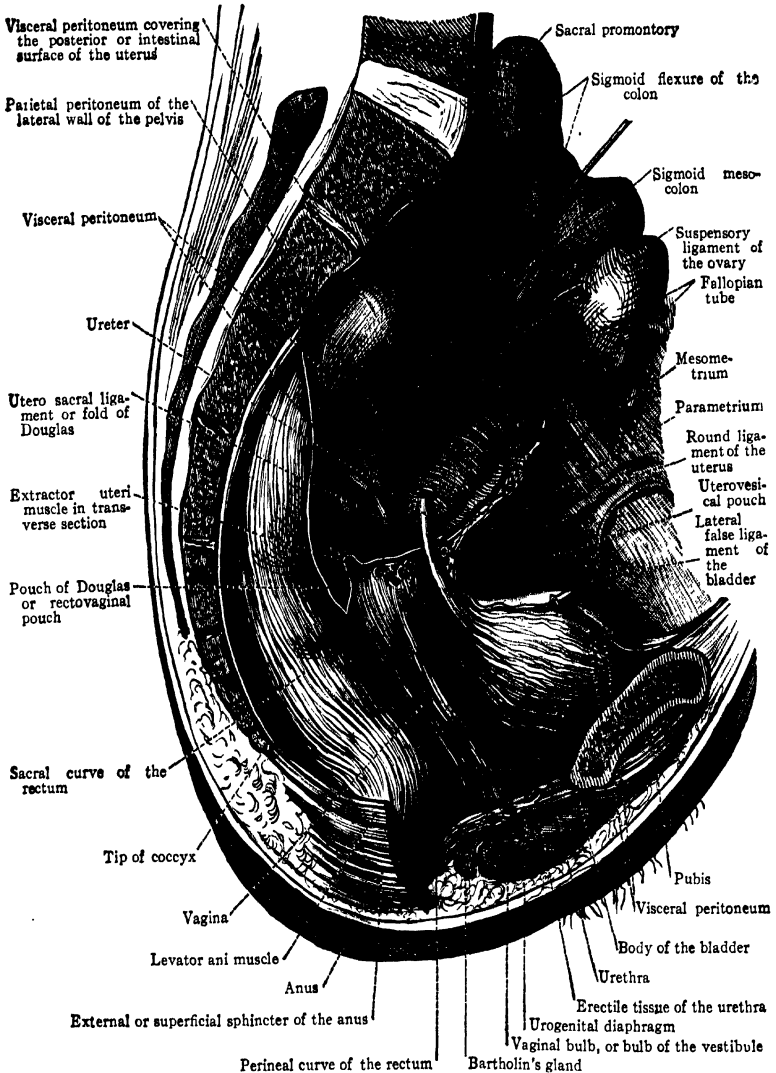


FIG. 2.—Portion of the pelvic viscera in the female, and their relation to the muscles of the pelvic outlet (or perineal muscles), shown in the left half of the pelvis, seen from the right side.—The parametrium. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

in shape and size, in its muscular substance and mucous lining, and in its vascular and nervous supply.

At the time of puberty the infantile uterus undergoes changes affecting both its external form and the shape of its interior cavity. The body of the uterus enlarges to the size characteristic of sexual maturity, and its mucous membrane becomes the seat of periodic changes. This waxing and waning growth and transformation of the uterine mucous membrane continues throughout the period of menstrual activity, the most superficial layers of the membrane being shed during menstruation, a process followed by regeneration, which is itself succeeded by the premenstrual thickening. When conception occurs, still more extensive changes ensue, the fertilized ovum becoming imbedded in the uterine mucous membrane, and the pregnant uterus, in shape and structure and in the respective relations of the body and neck of the organ, in the increasing distension of its veins and the increasing size of its nerves, becoming adapted to the important functions it has now to fulfil. When these have been fulfilled, and, parturition having taken place, the uterus is empty once more, the organ again adapts itself to altered circumstances by the process of involution. Later, in the climacteric period, a slow regressive process occurs, the outward manifestation of which is the cessation of the menstrual flow, characterized anatomically by atrophy of the muscular tissue of the uterus and of its vascular apparatus, by the dessication of its mucous membrane, by obliteration of the lumen of the uterine cavity, and ultimately by senile degeneration and atrophy of the now entirely functionless organ, so that it becomes an insignificant, cicatrized, solid body.

Next to the ovaries and the uterus, it is the pelvic fascia which in its entire architectonic structure as well as in its individual parts undergoes the most notable changes in consequence of the processes of generation.

A short account of the nerves and blood vessels of the female genital organs appears indispensable, to facilitate the comprehension of the manner in which sexual processes are influenced by the nervous system, and to demonstrate the intimate connection between the blood-supply of the genital apparatus and the general circulation.

The complex nervous network of the female sexual organs is supplied by spinal as well as by sympathetic fibres, the fibres from the two systems anastomosing in a very intimate manner.

The greater number of the spinal nerves distributed to the

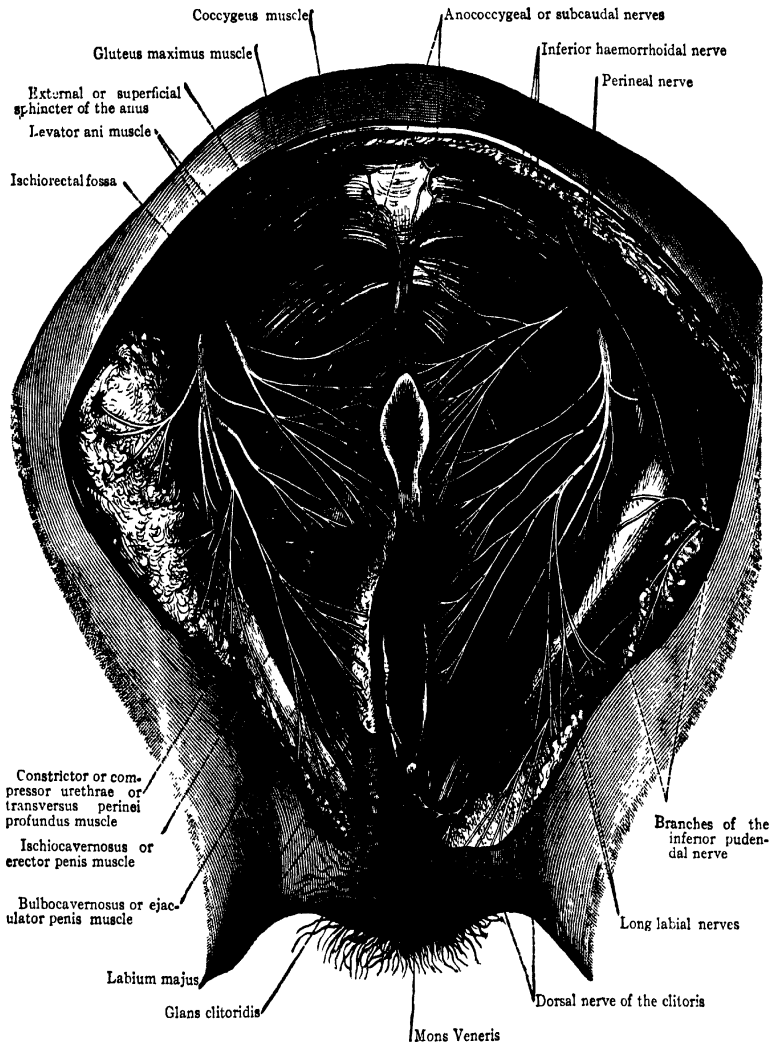


FIG. 3.—The distribution of the pudic nerve, *n. pudendus*, in the female perineal and pubic regions. The trunk of the pudic nerve, *n. pudendus*, is covered by the gluteus maximus muscle. On the right side of the body the branches of the inferior pudendal nerve, *rami perineales*, *nervi cutanei femoris posterioris* have been dissected out; but the branches of this nerve to the labium majus have been cut short. The formation of the anococcygeal or subcaudal nerves, *nn. anococcygei*, out of the posterior primary division of the coccygeal nerve and out of the perforating branches which arise from the anterior primary divisions of the fourth and fifth sacral nerves and the coccygeal nerve. (From Toldt: *Atlas of Human Anatomy*.—Rebman Company, New York.)

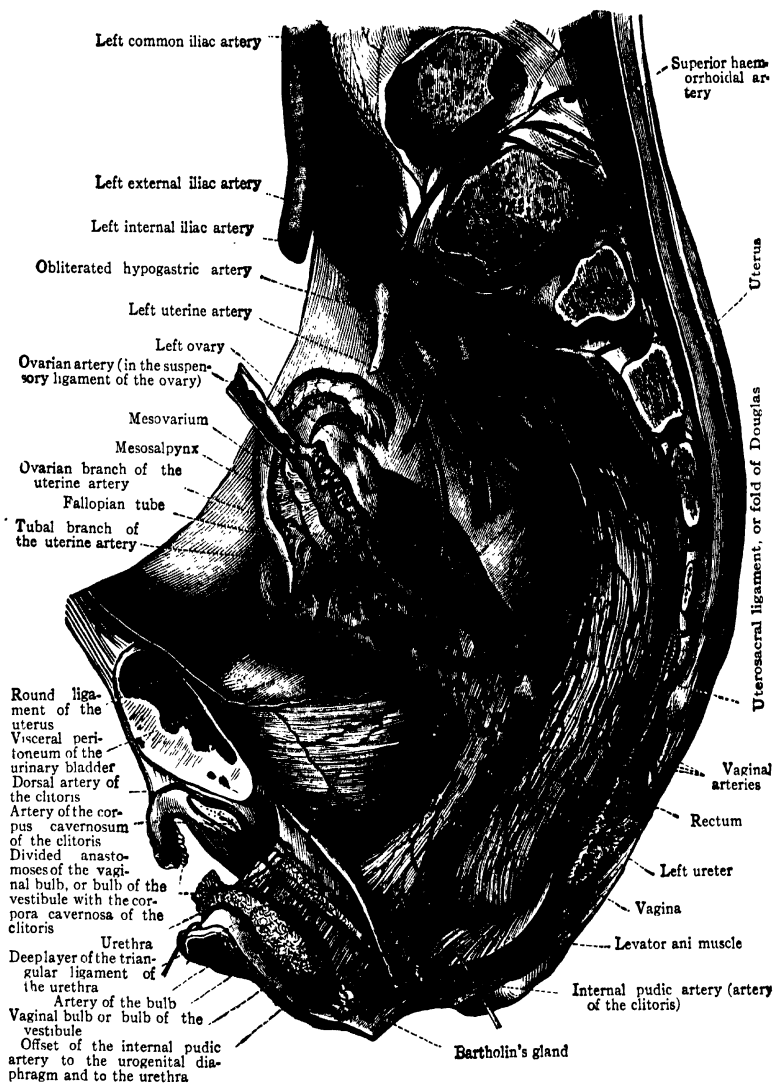


FIG. 4.—The distribution of the lateral sacral arteries, the superior haemorrhoidal or superior rectal artery, the uterine artery, the ovarian artery and the distal portion of the internal pudic artery. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

Attention must also be paid to the extremely rich lymphatic vascular system of the female genital apparatus. The body of the uterus and the annexa of that organ, the neck of the uterus and the vaginal fornices, the middle segment of the vagina, the lower segment of the vagina, the vestibule and the external genital organs — each of these possesses an independent set of lymphatic vessels, leading moreover to independent groups of lymphatic glands. It may be said that the lymph from the vulva passes to the inguinal glands, that from the vagina and the neck of the uterus to the internal and the external iliac lymphatic glands, that from the upper part of the uterus and also that from the ovaries and Fallopian tubes to the median group of lumbar lymphatic glands (also known, from their position in front of the aorta and the vena cava, as the aortic lymphatic glands) (*Chrobak von Rosthorn*).

The important influence which the genital processes exercise on the female organism as a whole is established not only by the anatomical relations just described but also by a number of physiological investigations and experiments and by the result of operations on the female genital organs.

Thermic and mechanical stimulation of the female genitals has, as my own experiments have shown, a notable influence on the heart and the general circulation. In these experiments, when uterine douches were given at temperatures of 4° C. (39° F.) and 45° C. (113° F.), the reflex nervous impulse which resulted from these manipulations had a two-fold influence on the circulation, manifesting itself first by an immediate and considerable augmentation in the functional activity of the heart, the frequency of which was increased in a degree proportional to the nervous sensibility of the individual, and secondly by a notable rise in blood pressure.

With a view to determining the influence of stimulation of the ovary on blood-pressure, *Röhrig* carried out some experiments on bitches, from which it appeared that electrical stimulation of the ovary invariably produced a remarkable increase in the general blood-pressure, an increase ranging from twelve to twenty-four millimeters of mercury. It further appeared in the course of these experiments that toward the end of the period of stimulation the rise in blood-pressure was always followed by a decline; to which, however, a renewed rise of blood-pressure succeeded after the stimulation was discontinued, provided the duration of this had not been excessive. Only after this second rise was the normal mean blood-pressure regained. Finally it was established that the pro-

nounced phenomena of vagus-irritation exhibited by the curve during and immediately after the stimulation of the ovary were invariable concomitants of the rise of blood-pressure produced by such stimulation.

According to the observations of *Federns*, the blood-pressure undergoes a rhythmical change between one menstrual period and the next, the pressure curve being normally at its lowest at the time of the commencement of the flow, and at its highest at some time during the two days immediately preceding the flow. This rhythmical change of blood-pressure manifests itself also some time before the first onset of menstruation, when the approach of puberty is indicated only by the menstrual molimina.

Observations made by *Kretschy* in a patient with a gastric fistula have proved the influence exercised on gastric digestion by the physiological processes occurring in the female reproductive organs. In this patient, his attention was especially directed to determining at what period of digestion the secretion of acid by the stomach attains its maximum, and how that secretion increases and diminishes. He observed that the digestion of breakfast was completed in four and one-half hours, the acid-maximum occurring in the fourth hour, and the reaction of the gastric contents becoming neutral one and one-half hours later. This apparently constant acid-curve began, however, to become irregular as soon as the first symptoms of the approach of menstruation became apparent. When the flow had actually begun, he found that the reaction of the gastric contents remained acid throughout the entire day. As soon as the flow was over, the normal acid-curve was immediately reestablished.

These observations have been confirmed by *Fleischer*. This investigator carried out his researches in menstruating women with normal stomachs, and found that with the appearance of the catamenia the process of digestion was almost always notably retarded, but that with the diminution and cessation of the flow digestion returned to the normal.

By stimulation of the central segment of the divided hypogastric or great uterine plexus, *Cyon* was able to provoke vomiting, a confirmation of the well-known physiological fact that irritative disturbances of the female reproductive organs have a reflex influence on the vomiting centre.

It is also clearly established that diverse stimulation of peripheral nerves, those for instance of the mammary gland, of the internal genitals, or of the epigastrium, is capable of affecting the motor centre of the uterus.

Worthy of note also are *Strassmann's* experiments, showing that

rise of pressure in the ovary causes swelling and structural changes in the uterine mucous membrane.

Striking also are *Neusser's* discoveries that during menstruation there is an increase in the eosinophil cells of the blood, and that by the intermediation of the sympathetic nervous system the ovaries exercise an influence on the hæmatopoietic function of the red marrow of the bones. Most noteworthy is the connection between the functional activity of the ovaries and osteomalacia. In this disease of metabolism we have to do, according to *Fehling's* now generally accepted assumption, with a trophoneurosis of the bones, a stimulation of the vasodilator nerves of the osteal vessels, dependent on a reflex impulse from the ovaries. The connecting path between the ovaries and the bones *Neusser* finds in this case also in the sympathetic nervous system.

The reflex influence exercised on the heart and the general circulation has been shown also by the results of operations on the female genital organs. In cases in which the ovaries have been removed, or in which these organs have been roughly handled, *Hegar* has noticed a great diminution in the frequency of the pulse, sometimes even cessation of the heart's action. In similar circumstances *Champonière* also observed as a rule diminished frequency of the pulse, but in some cases increased frequency. *Mariagalli* and *Negri* have described tachycardia following laparotomy and the extirpation of double pyosalpinx. *Bonvalot* has published cases in which, in consequence of vaginal or intra-uterine injections, in consequence of simple examination, and in consequence of the performance of version, sudden death has resulted from cardiac syncope.

The psychical influences which proceed from the female genital organs in the different periods of sexual life have also great significance for the organism as a whole. Manifold impulses both stimulating and depressing arising in the reproductive organs affect the workings of the mind. The maiden at puberty is affected by the knowledge of sexuality; the sexually mature woman, by the desire for sexual satisfaction, and by the yearning for motherhood; the wife, by the processes of pregnancy, parturition, and suckling, or, on the other hand by the distressing consciousness of sterility; the woman at the climacteric period, by the knowledge of the disappearance of her sexual potency. The mind is further sympathetically influenced by the stimulation of the terminals of the sensory nerves in the genital organs. Through the increase of such stimulation, through its spread to adjacent nerves and nerve tracts and to the entire nervous system, the mind is affected,

directly by irradiation, or indirectly by vasomotor processes and spinal hyperæsthesia.

Psychical manifestations and the nervous states associated with these are somewhat frequently, and even actual psychoses occasionally, encountered in the various phases of the sexual life of woman, sometimes taking the form of violent sexual storms, which may indeed, as ordinary menstrual reflexes, accompany every catamenial period.

Of great interest are the facts which have, in recent times especially, been scientifically established, pointing to a certain periodicity, to an undulatory movement of the general bodily functions of the female organism, dependent upon the sexual life. The observations of *Goodman*, *Jacobi*, *von Ott*, *Rabuteau*, *Reinl* and *Schichareff*, have shown that in woman the principal vital processes pursue a cycle made up of stages of increased and diminished intensity, and that this periodicity of the chief general processes of vital activity finds expression also in the functions of the reproductive organs. *Goodman* has compared this play of general vital functions to an undulatory movement. According to this writer, a woman's life is passed in stages, each of which corresponds in duration with a single menstrual cycle. Each of these stages exhibits two distinct halves, in which the vital processes are respectively ebbing and flowing: in the latter we see an increase of all vital processes, a larger heat production, a rise in blood-pressure, and an increased excretion of urea; in the former we see, on the contrary, that all these vital processes display a diminished intensity. The moment when the period of increased vital activity is at an end, the moment when the ebb begins, corresponds, according to *Goodman*, to the commencement of the catamenial discharge.

Goodman sought for verification of this undulatory theory of the sexual life of woman in certain data regarding the bodily temperature and the blood-pressure. A more extensive research was undertaken by *Jacobi*, who, as the result of her observations, came to the following conclusions. In eight cases she noticed in the premenstrual epoch a rise of temperature ranging from 0.05° C. to 0.44° C. (0.09° F.— 0.79° F.); and during the catamenial discharge a gradual fall of 0.039° C.— 0.25° C. (0.072° F.— 0.45° F.), never less, that is to say, than a quarter of a degree Centigrade; but in the majority of cases the temperature did not, while the catamenia lasted, regain the normal mean. She further observed in the generality of cases an increased excretion of urea during the premenstrual epoch; and a notable fall in blood-pressure during menstruation.

Reinl's observations on healthy women, in whom menstruation ran a normal course, showed that in the great majority of cases in

the premenstrual epoch the temperature was elevated as compared with that of the interval, that in eleven out of twelve cases the temperature gradually declined during menstruation, to fall in three-fourths of the cases below the mean temperature of the entire interval, and exhibiting in the post-menstrual epoch a still further depression, giving place, however, to a somewhat higher mean temperature during the first half of the interval. In the second half of the interval a higher mean temperature was observed than in the first half.

If we make a graphic representation of the mean differences in temperature commonly observed throughout the various stages of an entire menstrual cycle, we see that the curve does in fact take the form of a wave. That drawn by *Reinl* is shown in the following figure: (FIG. 5.)

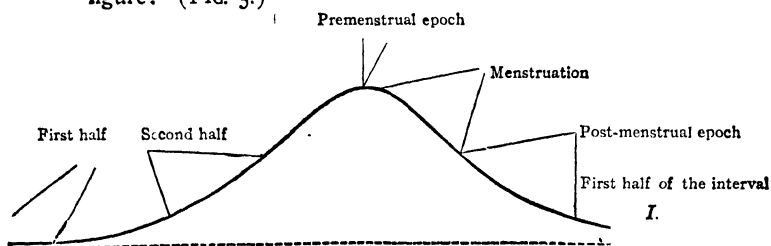


FIG. 5.

The rising portion of the wave, the beginning of the tidal flow, corresponds to the second half of the interval; the height of the tidal flow, the crest of the wave, corresponds to the premenstrual epoch. As the flow gives place to the ebb, as the wave begins to decline, we come to the actual period of the catamenial discharge; later in the ebb is the post-menstrual epoch, and the lowest portion of the declining wave corresponds to the first half of the interval. Rhythmic changes corresponding to those observed in the temperature have been recorded—at least in isolated stages of the menstrual cycle—affecting the blood-pressure by *Jacobi* and by *von Ott*, affecting the excretion of urea by *Jacobi* and by *Rabuteau*, and affecting the pulse by *Hennig*. It is evident that the vital activity of the organism attains its maximum shortly before menstruation; and that with or immediately before the appearance of the catamenial discharge, a decline of that activity commences.

Schrader, through his researches on metabolism during menstruation in relation to the condition of the bodily functions during this process, has established that immediately before menstruation the elimination of nitrogen in the feces and the urine is at its lowest, a fact which indicates that at this period of the menstrual cycle the disintegration of albumen in the body is notably diminished.

Von Ott found in thirteen cases out of fourteen that at the beginning of the catamenial discharge or just before a considerable fall in blood-pressure occurred, and that throughout the flow the pressure almost always remained below the mean, no rise taking place till menstruation was finished; this fall in blood-pressure during menstruation was more considerable than could be accounted for by the moderate hæmorrhage. The same author, in conjunction with *Schichareff*, examined fifty-seven healthy women in respect of heat-radiation, muscular power, respiratory capacity, expiratory and inspiratory power, and tendon-reflexes. He found that the energy of the functions of the female body increased before the beginning of menstruation, but declined with or immediately before the appearance of the catamenial discharge. He exhibited this rhythmical variation in the vital processes by means of the following curve, in which the line *AB* represents these physiological variations, whilst on the abscissa line *ce*, the days of observation are recorded, and the interval *mn* represents the menstrual period. The degree of intensity of the united functions is indicated by the numbers 0 — 100 on the ordinate.

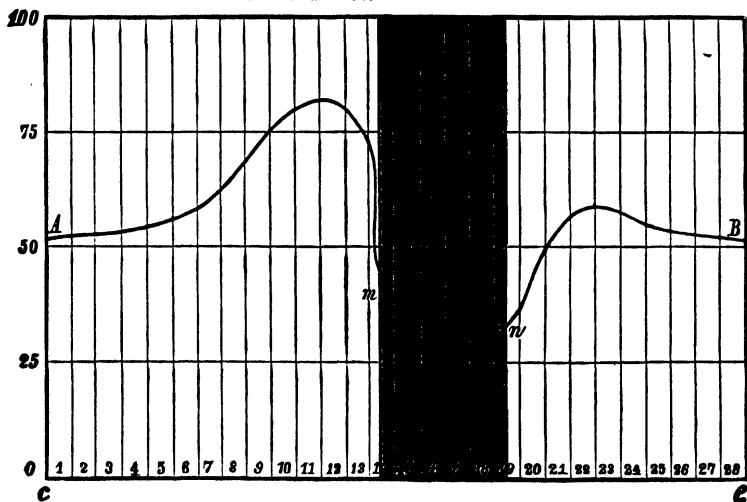


FIG. 6.

Still another point of view from which the influences affecting the female organism as a whole may be regarded has very recently become apparent in consequence of the doctrine of *Broun-Séguard* relating to the internal secretions of ductless glands. As regards the female reproductive glands, which in consequence of their structure must be referred to the group of ductless glands, and yet owing to

their secretory function must be classed among secreting glands (so that the nature of the ovary is that of a secreting gland without an excretory duct), it would appear that these glands are not concerned only with the specific female reproductive functions of menstruation and ovulation, but that they also exercise a powerful influence on the nutritive processes, on metabolism and hæmatopoiesis, and on growth and development in their mental as well as their physical relations.

It is supposed that these glands under normal conditions enrich the blood with certain substances, which in part assist in hæmatopoiesis, and in part by regulating the vascular tone in the various organs are concerned in the normal processes of assimilation and general metabolism. According to *Etienne* and *Demange*, ovariin possesses an oxidising power similar to that possessed by spermin. Thus it becomes easy to understand how disturbances in the functions of the ovaries give rise to disturbances in the processes of general metabolism and of assimilation. Some go even further, though in doing so they leave the ground of assured fact, suggesting that the ovary in certain circumstances produces toxins, or that the normal ovary possesses an antitoxic function, and speaking of an occasional ovarian auto-intoxication of the body or of a menstrual intoxication. Thus, chlorosis is by some regarded as a disturbance of hæmatopoiesis, dependent on an abnormal condition of the female reproductive organs during the period of development, and referable to a disturbance of the internal secretion of the ovaries (*Charrin, von Noorden, Salmon, Etienne, and Demange*). And it is now generally assumed, the assumption being based on the observations recently made concerning the organotherapeutic employment of the chemical constituents of the ovary, that many of the disorders, and especially those connected with the vasomotor system, common during the climacteric period, are dependent on the deficiency of the products of the internal secretion of the ovary that accompanies the cessation of the menses.

Recent experimental investigations on this subject have shown that the interconnection between the female genital organs and the organism as a whole, between the functions of the reproductive organs and the functions of other organs, does not depend on nervous influences only, but that in this interconnection the blood vascular system and the lymphatic vascular system also play their parts. *Goltz* has proved by actual experiment that the nervous influence on menstruation and ovulation is not the only determinant. In a bitch, he divided the spinal cord at the level of the first lumbar vertebra, and observed, as soon as the animal had recovered from the operation, the appearance of the usual signs of heat; the bitch was

impregnated, and gave birth to one living and two dead puppies; lactation and sucking took place as in a normal animal. When the bitch was killed and the body examined it was found that no reunion had taken place in the severed spinal cord. The experiments of *Halban* gave similar results. He found that in apes, if the ovaries are removed from their normal situation and successfully transplanted to some region remote from the genital organs, the animals remain capable of menstruating. But if the ovaries, which have been transplanted beneath the skin or beneath the peritoneum, are subsequently entirely removed, menstruation, which has continued regularly after the first operation, ceases altogether after the second. It follows from these experiments that the cessation of the menstrual process may be considered to be brought about through the intermediation of the lymphatic or blood-vascular system, by the absence of a kind of internal secretion.

Loewy and *Richter* have further proved by experiment that in spayed bitches the consumption of nitrogen is less by about 20 per cent. and the entire gaseous interchange less by about 9 per cent., as compared with what takes place in normal animals, and that this change in respiratory metabolism lasts for a long time after the oöphorectomy, for as much as nine to twelve months. If dried ovaries are given to such animals in their food, the gaseous interchange rises to the former level and even higher.

The undulatory movement of the vital processes in woman is apparently in some way dependent on ovulation, though the nature of the connection has not hitherto been fully elucidated. This view is confirmed by the fact that no such rhythmic variation in the bodily functions can be detected either in girls under thirteen years of age, or in women from fifty-eight to eighty years of age in whom menstrual activity has entirely disappeared. The menstrual rhythm begins at puberty and ends when ovulation ceases.

A further contribution to the doctrine of the undulatory movement of the vital processes in woman is to be found in my own observations that pathological symptoms which have become manifest before and at the time of the first onset of menstruation, and have given but little trouble throughout the period of developed and regular sexual activity, are apt when menstruation ceases to recrudescence, and to become as prominent as they were at the commencement of the sexual life. Women who at the time of puberty suffered from cardiac troubles, from digestive disturbances, or from various forms of nervous irritation, and in whom as they grew up these disorders passed more or less into abeyance, are apt at the climacteric period to exhibit, as I have frequently been able to observe, a violent return of these symptoms, in the form, as the

case may be, of tachycardia, of dyspeptic troubles, or of psychoneuroses. In this connection we may mention an observation of *Potain's*, who distinguishes a peculiar form of chorosis, occurring in individuals of delicate constitution, which, though apparently cured, reappears at the menopause.

Related to the sexual life of woman is another attribute, one intimately connected with the idea of the female sex, and one which since the primeval days of humanity has filled men with delight and poets with inspiration—the attribute of beauty.

The beauty of woman, a prominent secondary sexual character, makes its first appearance at puberty, when the girl's form, hitherto undifferentiated in its external bodily configuration, begins to assume a soft and rounded appearance, when the features become regular, the breasts enlarge, and the pubic hair begins to grow—when, in short, to the primary sexual characters already existing, the secondary sexual characters are superadded.

Feminine beauty continues to increase until the attainment of sexual maturity. In her third decade woman arrives at the acme of her sexual life and at the same time attains the perfection of her beauty.

The ensuing sexual phases, pregnancy, parturition, and lactation, entail a decline in beauty, not rapid indeed, but advancing gradually, with the slow yet sure-footed pace of time. The organic revolutions accompanying these processes leave traces recorded upon the surface of the body in conspicuous and indelible characters. The illnesses, also, which so often accompany the fulfilment of sexual functions, in injuring health impair also beauty.

A woman who has given birth to and nursed an infant begins to lay on fat, and this tendency to obesity becomes more pronounced as the climacteric period approaches. The breasts become inelastic and pendent, the abdomen becomes ungracefully prominent; the tonicity of the entire organism gradually declines, and, in consequence of the loss of elasticity in the subcutaneous cellular tissue, the dreaded wrinkles make their appearance and the features become wizened. Beauty is a thing of the past. With the cessation of the sexual life the external secondary sexual characters disappear, and the old woman is even farther removed than the old man from our conception of beauty.

As *Mantegazza* insists, the beauties peculiar to women are one and all sexual; they depend, that is to say, upon the peculiar functions that nature has allotted to woman in the great mystery of procreation. One of the most vivid and poetical descriptions in ancient or modern literature of these secondary sexual characters on which feminine beauty depends is to be found in the Song of Solomon.

In the following figure (FIG. 7) the curve of beauty of woman is given as drawn up by *Stratz*. In one case it may rise very quickly, to decline with equal quickness — the so-called *beauté du diable*;¹⁶ in other cases, again, the curve rises very slowly, and declines also very slowly, the culmination of the curve being in this case attained later, and when attained being absolutely higher, than in the case of the steeper curve.

The age at which the maximum of beauty is attained is a very variable one. In the southern races this often occurs as early as the fourteenth or fifteenth year of life; but in the peoples of the Teutonic stock, Germans, Dutch, Scandinavians, and English, not as a rule before the twentieth year, and it may be even later. *Stratz*

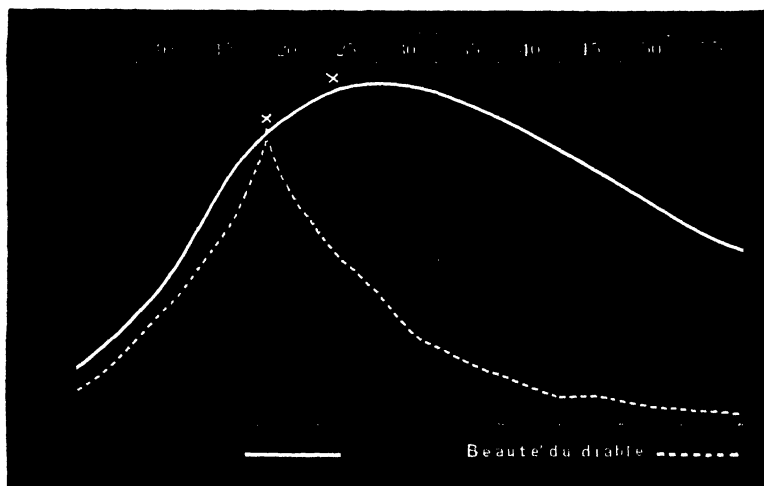


FIG. 7.

has known cases in which women did not attain the prime of their beauty until the thirtieth and even the thirty-third year. The same author, a most competent authority as regards the subject of feminine beauty, affirms that a beautiful woman is most beautiful when the period of maximum beauty coincides in her case with the first month of her first pregnancy. With the commencement of pregnancy the processes of nutrition are accelerated, all the tissues are tensely filled, the skin is more delicately and at the same time more brightly tinted owing to the greater activity of the circulation, the breasts become firmer and more elastic. Thus the attractive characteristics of beauty at its fullest maturity become

¹⁶ Beauty of the devil.

enhanced, but for a short time only, since the enlargement of the abdomen in the further course of pregnancy impairs the harmony of the figure. Finally we must point out, before dismissing this subject, that women of the so-called better classes arrive as a rule at maturity later, and remain beautiful for a longer period, than women of the working classes.

The degree to which the female organism as a whole is influenced by the processes of the sexual life that occur in the genital organ depends upon many of the characteristics that combine to make up the individuality. Inherited characteristics, temperament, and race, play a great part in this connection; and not less important than these are the social conditions, the environment, in which the women under consideration pass their life. Thus, among women belonging to the poorer, labouring classes, the reflex manifestations in other organs dependent upon the processes of the genital organs are less frequent and less intense than among women belonging to the well-to-do strata of society and to the cultured classes; less also in the country than in large towns. In phlegmatic individuals, such manifestations exhibit less intensity than in those of an active, ardent temperament; they are less frequent in persons with a powerful constitution than in those endowed by inheritance with an unstable nervous system. Finally, they are less often encountered among families whose upbringing has aimed at hardening the constitution and at inculcating the control of instinctive impulses, than among those in whom from early childhood sensibility and impulsiveness have been given a loose rein.

Extremely variable also are the sympathetic disturbances and morbid states which depend on the processes of the sexual life of woman. "Le cri de l'organe souffrant ne vient pas de l'utérus, mais de tout l'organisme,"¹⁷ says *Courty*. And a large number of isolated observations has shown how complex are the relations between the healthy and unhealthy female genital organs and the other organs of the body as well as the organism as a whole. Precise and incontestable proofs exist of such relations between the female genital organs and morbid changes in the eye and ear, the skin, the respiratory organs, and the vascular and nervous systems.

The influence exercised by the reproductive system on the general vital processes of woman is indicated also by the general statistics of mortality and the incidence of disease. Mortality in women, the earliest years of childhood being left out of considera-

¹⁷ "The cry of the suffering organ comes not from the uterus but from the entire organism."

tion, is at its highest precisely during the great sexual epochs, namely at the time of puberty, during pregnancy, during the puerperium, and at the climacteric period. The complete performance of the reproductive functions entails a higher proportion of illnesses and death; and statistical records show that the mortality of married women between twenty and forty years of age, during the period, that is to say, in which in consequence of marriage they fulfil the duties of sexual intercourse and procreation, and are exposed to the dangers connected with these sexual acts, is much higher than the mortality of unmarried women of corresponding ages. Infection with the gonococcus and with the virus of syphilis, chronic salpingitis, metritis, and parametritis, the manifold diseases of pregnancy, the diseases of the puerperium, the various displacements of the uterus, osteomalacia — all these are pathological states the dependence of which upon the sexual life of the married or at any rate sexually active woman is indisputable. But the complete renunciation of sexual activity appears also to exercise an injurious influence on the health, and to give rise or at least predispose to morbid manifestations. Hysteria, for instance, chlorosis, uterine myomata, and various neuroses, have long been supposed to depend in part upon such renunciation, though the causal connection cannot be regarded as yet fully established.

Especially true as regards woman, indeed, is that which *Ribbing* says concerning the sexual life in general: "Since all human life and being has its origin in sexual relations, these sexual relations may be regarded as the heart of humanity. We may work day and night for the good of humanity, we may sacrifice for that good our time and our blood, but all this work and all this sacrifice appear to me to remain useless if we neglect and despise the sexual life, the eternally self-renewing elementary school of true altruism."

From the vital phase in which, marked by the visible manifestations of puberty and by the first appearance of menstruation, ovulation is assumed to begin, the sexual life of woman continues to the period of life in which, marked by the climacteric cessation of menstruation, ovulation also ceases. The total duration of this sexual period in woman's life is usually about thirty years; but it is subject to great variations, from six to forty-six years according to the available statistics, these variations depending upon climate, race, constitution, and the sexual activity of the person under consideration.

The duration and the intensity of the sexual life of woman depends upon a series of external conditions affecting the individual, but especially upon the inherited predispositions, upon the constitutional conditions, upon the varying vital power of the individual.

My own observations have led me to formulate, as a general law, that the earlier a woman (climatic and social conditions being similar in the cases under comparison) arrives at puberty, the earlier, that is to say, that menstruation first makes its appearance, the greater will be the intensity and the longer the duration of sexual activity, the more will the woman in question be predisposed to bear many children, the more powerfully will the sexual impulse manifest itself in her, and the later will the menopause appear. It seems that in such women a more intense vitality animates the reproductive system, bringing about an earlier ripening of ova, a more favorable predisposition on the part of these ova to fertilization by the spermatozoa, a livelier manifestation of sexual sensibility, and a longer duration of ovarian functional activity.

My general views on this subject are embodied in the following propositions:

1. The duration of sexual activity is less in the women belonging to the countries of southern Europe than in those belonging to the countries of northern Europe. It would appear that in those climates in which ovulation begins sooner and menstruation first appears at an earlier age, the menopause also appears earlier; but that, on the contrary, in those climates in which puberty is late in its appearance, the decline of sexual activity is similarly postponed.

2. Women in our mid-European climates, in whom puberty appears at an early age, the first menstruation occurring between the ages of thirteen and sixteen, exhibit a more prolonged duration of the sexual life, of menstrual functional activity, than women in whom menstruation begins late, between the ages of seventeen and twenty. Extremely early appearance of the first menstruation — so early as to be altogether abnormal — has, however, the same significance as abnormally late onset of menstruation; both indicate that the sexual life will be of short duration.

3. Women whose reproductive organs have been the seat of a sufficient amount of functional activity, who have had frequent sexual intercourse, have given birth to several children, and have themselves suckled their children, have a sexual life of longer duration, as manifested by the continuance of menstruation, than women whose circumstances have been just the opposite of these, unmarried women, for instance, women early widowed, and barren women. Sexual intercourse at a very early age, however, accelerates the onset of the climacteric period and the termination of the sexual life. The same result follows severe or too frequent confinements.

4. The sexual life has a shorter duration in the women of the laboring classes and belonging to the lower strata of social life, as

compared with upper class and well-to-do women. Bodily hardships, grief, and anxiety also hasten the onset of sexual death.

5. Women who are weakly and always ailing have a shorter sexual life than women who are powerfully built and always in good health. When irregularities and disorders have appeared in the various sexual phases, the decline of sexual activity occurs earlier than in women whose functions have in this respect been normal. Certain constitutional conditions, such as extreme obesity, certain acute diseases, such as typhoid fever, malaria, and cholera, and certain diseases of the uterus and its annexa, chronic inflammatory conditions for instance, bring about a notable shortening of the duration of the sexual life.

In 500 cases that have come under my own observation, the women concerned belonging to very various nationalities, the duration of the sexual life, as witnessed by the continuance of menstruation, was as follows:

Menstruation continued for:

6 years in 1 woman.	22 years in 20 women.	33 years in 31 women.
7 years in 1 woman.	23 years in 24 women.	34 years in 26 women.
9 years in 2 women.	24 years in 18 women.	35 years in 12 women.
11 years in 4 women.	25 years in 16 women.	36 years in 12 women.
15 years in 6 women.	26 years in 25 women.	37 years in 10 women.
16 years in 8 women.	27 years in 26 women.	38 years in 8 women.
17 years in 12 women.	28 years in 29 women.	39 years in 6 women.
18 years in 15 women.	29 years in 36 women.	40 years in 2 women.
19 years in 9 women.	30 years in 22 women.	43 years in 2 women.
20 years in 6 women.	31 years in 32 women.	45 years in 1 woman.
21 years in 18 women.	32 years in 49 women.	46 years in 1 woman.

Thus we see that the duration of the sexual life varies from 6 to 46 years. The most frequent duration is one of 32 years, next to this one of 29, next again, 31, 33, and 37 years, respectively. In 6 women only did the duration of the sexual life exceed 40 years, and in 4 only was it less than 11 years. In half of all my cases the duration of the sexual life was between 27 and 34 years, and from these figures we obtain an average duration of about 30 years.

For North Germany, *Krieger* gives data from which it appears that in this region the average duration of the sexual life is 30.49 years. In more than half of the 722 cases recorded by this writer the duration was between 31 and 37 years. In isolated cases the duration was very short, not exceeding 8, 9, or 10 years, or, on the other hand, as long as 47 years; whilst the number of cases increased fairly regularly up to the duration of 34 years, and thereafter again diminished.

As regards Austria, *Szukits* has collected information in the case of 269 women, and found, in these, that the duration of the sexual life varied from 12 to 45 years. The average duration was

29.16 years; in more than half of the women, the period of sexual activity lasted from 21 to 30 years; the shortest period observed was 12 years, the longest 45 years.

The period of sexual activity lasted:

12 years in 2 women.	25 years in 7 women.	35 years in 18 women.
14 years in 1 woman.	26 years in 13 women.	36 years in 19 women.
15 years in 2 women.	27 years in 5 women.	37 years in 14 women.
17 years in 3 women.	28 years in 26 women.	38 years in 9 women.
19 years in 3 women.	29 years in 18 women.	39 years in 8 women.
20 years in 17 women.	30 years in 17 women.	40 years in 1 woman.
21 years in 10 women.	31 years in 8 women.	42 years in 1 woman.
22 years in 7 women.	32 years in 8 women.	43 years in 1 woman.
23 years in 5 women.	33 years in 13 women.	44 years in 2 women.
24 years in 17 women.	34 years in 8 women.	45 years in 2 women.

In Poland, according to *Raciborski*, the duration of sexual activity is in Jewesses 23 years, but in women of Slavonic blood 31 years.

In France, according to *Courty* and *Puech*, the usual duration of the sexual life is from 28 to 30 years.

According to *Puech*, among 10 women menstrual activity lasted:

33 years in 2 women.	36 years in 2 women.	43 years in 2 women.
35 years in 1 woman.	39 years in 2 women.	44½ years in 1 woman.

Brierre de Boismont gives the following particulars of the duration of menstrual activity in 178 Frenchwomen:

5 years in 1 woman.	23 years in 12 women.	34 years in 7 women.
6 years in 1 woman.	24 years in 8 women.	35 years in 5 women.
8 years in 1 woman.	25 years in 8 women.	36 years in 10 women.
11 years in 1 woman.	26 years in 11 women.	37 years in 6 women.
16 years in 4 women.	27 years in 7 women.	38 years in 5 women.
17 years in 4 women.	28 years in 6 women.	39 years in 2 women.
18 years in 1 woman.	29 years in 7 women.	40 years in 7 women.
19 years in 3 women.	30 years in 13 women.	41 years in 1 woman.
20 years in 3 women.	31 years in 13 women.	42 years in 3 women.
21 years in 4 women.	32 years in 9 women.	44 years in 2 women.
22 years in 3 women.	33 years in 9 women.	48 years in 1 woman.

For England, *Tilt* gives the mean duration of menstrual activity, as observed in 500 women, as 31.21 years; it varies between 11 and 47 years; there are more cases with a period of 34 years than with any other integral number of years. *Tilt* found the duration to be:

11 years in 1 woman.	25 years in 22 women.	37 years in 16 women.
13 years in 1 woman.	26 years in 11 women.	38 years in 15 women.
15 years in 3 women.	27 years in 25 women.	39 years in 15 women.
16 years in 1 woman.	28 years in 29 women.	40 years in 6 women.
17 years in 2 women.	29 years in 35 women.	41 years in 4 women.
18 years in 4 women.	30 years in 36 women.	42 years in 7 women.
19 years in 1 woman.	31 years in 33 women.	43 years in 5 women.
20 years in 3 women.	32 years in 38 women.	44 years in 3 women.
21 years in 6 women.	33 years in 35 women.	45 years in 1 woman.
22 years in 11 women.	34 years in 49 women.	46 years in 1 woman.
23 years in 11 women.	35 years in 33 women.	47 years in 3 women.
24 years in 10 women.	36 years in 26 women.	

For London the average figure is 34 years; for Paris, 30 years; for Vienna, 29 years; and for Berlin, 34 years.

From the data of various observers obtained from diverse nationalities, the following table has been compiled, exhibiting the mean duration of the sexual life:

Comparative Table Showing the Duration of the Sexual Life in Various Nationalities.

	Germany.	Austria.	France.	England.	Denmark.	Norway.	Russia.
Number of Cases..	722	265	178	500	312	391	100
Mean duration of menstrual activity, in years.....	30.4	29.1	29.1	31.8	27.9	32	31
Observers' names..	Krieger, L. Mayer.	Szukits.	Brierre de Boismont.	Whitehead.	Hannover.	Faye & Vogt.	Lieven.

In the temperate zone the sexual life of woman lasts longer than in the colder and subarctic regions. Still more favorable is the contrast between the temperate zone and the countries of the tropics, in which the duration of the period of menstrual activity is limited to eighteen or twenty years. According to some isolated observations the duration of sexual activity in Arabian women in Africa was as little as nine years.

A certain influence on the duration of the sexual life is exercised by the commencement of menstruation at an earlier or later age than the average. The total duration of menstrual activity is more variable in women who begin to menstruate early than in women who begin to menstruate late, in whom the duration of the sexual life is a more regular one. In those women who begin to menstruate early the mean duration of the sexual life is about thirty-three years, in those who begin to menstruate late it is about twenty-seven years.

The following data, based on the observation of 250 cases, are published by *W. Guy*, regarding the duration of the sexual life, that is to say of menstrual activity, in women beginning to menstruate early and those beginning to menstruate late, respectively:

<i>Menstruation began</i>	<i>Duration of the sexual life.</i>
In 5 cases in the 8th to the 10th year.....	Averaging 36.60 years.
In 70 cases in the 11th to the 13th year.....	Averaging 33.65 years.
In 110 cases in the 14th to the 16th year.....	Averaging 30.85 years.
In 56 cases in the 17th to the 19th year.....	Averaging 28.35 years.
In 9 cases in the 20th year or later.....	Averaging 20.45 years.

A further analysis of these 250 cases is given by *Guy* in the following table:

<i>First appearance of menstruation.</i>	<i>Average age at which menstruation ceased, in years.</i>	<i>Duration of menstrual activity.</i>
In 1 case in the 8th year.....	42	34 years.
In 2 cases in the 9th year.....	46	37 years.
In 2 cases in the 10th year.....	47	37 years.
In 10 cases in the 11th year.....	47.10.....	36.10 years.
In 29 cases in the 12th year.....	45.34.....	33.34 years.
In 31 cases in the 13th year.....	46.16.....	33.16 years.
In 39 cases in the 14th year.....	45.33.....	31.33 years.
In 40 cases in the 15th year.....	46.30.....	31.30 years.
In 41 cases in the 16th year.....	46.14.....	30.14 years.
In 26 cases in the 17th year.....	45.18.....	28.18 years.
In 19 cases in the 18th year.....	46.87.....	28.87 years.
In 11 cases in the 19th year.....	46.18.....	27.18 years.
In 5 cases in the 20th year.....	40.80.....	20.80 years.
In 3 cases in the 21st year.....	41.66.....	20.66 years.
In 1 case in the 23d year.....	41	18 years.

Hannover also gives data respecting the relation between the duration of menstrual activity and the early or late appearance of menstruation. These data are tabulated as follows:

<i>First appearance of menstruation.</i>	<i>Average age at which menstruation ceased, in years.</i>	<i>Duration of menstrual activity.</i>
In 5 cases in the 12th year.....	47.80.....	35.80 years.
In 10 cases in the 13th year.....	45.89.....	32.89 years.
In 50 cases in the 14th year.....	44.98.....	30.98 years.
In 34 cases in the 15th year.....	45.56.....	30.56 years.
In 38 cases in the 16th year.....	44.13.....	29.13 years.
In 36 cases in the 17th year.....	43.00.....	26.00 years.
In 49 cases in the 18th year.....	44.96.....	26.96 years.
In 33 cases in the 19th year.....	44.79.....	25.79 years.
In 38 cases in the 20th year.....	45.36.....	25.36 years.
In 10 cases in the 21st year.....	44.10.....	23.10 years.
In 4 cases in the 22d year.....	43.50.....	21.50 years.
In 3 cases in the 23d year.....	44.33.....	21.33 years.
In 4 cases in the 24th year.....	39.50.....	15.50 years.

Totals: In 412 cases the average age at the menopause was 44.82, and the average duration of menstrual activity was 27.973 years.

From the tables of *L. Mayer*, *Krieger* has instituted a comparison between the duration of menstrual activity in 101 women who began to menstruate early and 180 women who began to menstruate late, finding in the case of the former a mean duration of 33.673 years, and in the case of the latter a mean duration of 27.344 years, showing therefore a sexual life longer on an average by 6.429 years in those in whom puberty was early as compared with those in whom puberty was late.

From the tables of *Tilt*, based on the observation of 164 cases, 76 women in whom menstruation appeared early and 88 in whom

it appeared late, we learn that among the former the shortest duration of menstrual activity was 18 years, among the latter 12 years; among the former the longest duration was 37 years, among the latter only 33. The majority of those who began to menstruate early continued to menstruate for 28, 31, 32, 33, 34, 35, 36, 38, or 39 years; those who began to menstruate late, for 23, 27, 28, 30, or 31 years. The mean duration of the sexual life in those who began to menstruate early was 33.66 years; in those who began to menstruate late it was 28.28 years. Since the average duration of the menstrual function is given by *Tilt* as 31.33 years, those who began to menstruate early exceeded this average by 2.33 years, while those who began to menstruate late exhibited a duration of menstrual activity of at least three years less than the average.

In addition to climate, nationality, and the age at which menstruation begins, the sexual activity of women also exercises an influence on the duration of their sexual life, and of especial importance in this connection are the number of children born, and exercise or neglect of the function of lactation. From my own observations on this matter it appears, that in women who are healthy and of powerful constitution, whose reproductive organs have been sufficiently exercised, who have given birth to several children and have suckled these children themselves, the duration of menstrual activity is in general notably longer than in women whose circumstances have been just the opposite in these respects. Among the women in my own series of cases in whom menstrual activity lasted longest, of the 177 women in whom menstruation ceased between the forty-fifth and the fiftieth year of life, 1 only was unmarried, 2 were married but childless, 32 married with 1 or 2 children only, and 142 married and with more than 2 children; of the 89 women in whom menstruation ceased between the fiftieth and the fifty-fifth year of life, none were either unmarried or childless, 19 were married with 1 or 2 children, 17 married and with more than 2 children; of the 17 women in whom menstruation ceased later than the fifty-fifth year of life, there were 2 only with less than 2 children, but 10 who had each given birth to from 6 to 8 children. A similar influence is exercised by the function of lactation. Among 40 women who had not suckled their children, the average duration of menstrual activity was 4 years less than the general mean.

As regards the conditions of life, *L. Mayer* affirms that the duration of sexual activity among well-to-do women is on the average a year and a half longer than among women of the working classes.

Metschnikoff has drawn attention to the remarkable disharmony in the development of three of the phases of the sexual life of

woman, inasmuch as the sexual impulse, the union of the sexes, and the capacity for procreation, which, considering their nature and purpose, might have been expected to be attuned so as to act in harmony, exhibit as a matter of fact no such relation; the different factors of the sexual function develop independently and unharmoniously. In a child not yet fitted to fulfil the function of procreation, the sexual impulse will none the less make its appearance, and be liable to misuse. In the girl the pelvis does not attain that complete development which fits it for the process of parturition until toward the age of twenty, whilst puberty occurs at the age of sixteen. "A girl of ten is capable of aspiring to play the part of a woman, but not before the age of sixteen is she fitted to play that part, nor indeed fitted to become a mother before the age of twenty."

In general, we may say, regarding the women of our own part of the world, that in those who are healthy, who lead a regular life, are well fed, free from the pressure of anxieties, with their sexual functions sufficiently exercised, the duration of the sexual life is longer than in women whose circumstances are the reverse of those just enumerated. It is a sign of decadence when women of the well-to-do classes, leading a life of ease, manifest a diminished duration of the sexual life. The greatest physical power and the highest ethical development are associated with a lengthening of life in general, and associated also with a lengthening alike in the sexual life of woman and the sexual potency of man. A decline in morals and culture entails a diminution of sexual vital capacity, this being true alike of individuals, of families, and of nations. Woman is venerated and valued the more, the longer the duration of her sexual life; a woman in whom the sexual life is short quickly loses value and significance, both in domestic and in social circles.

The social significance of the sexual life of woman is disproportionately greater and farther reaching than the sexuality of the male, as the former is concerned with the fundamental principles of human social life, influencing the constitution of the family, and controlling the good of the coming race. Sexual purity, which to the youth is a romantic dream, is to the maiden a vital condition of existence; adultery, in the husband a pardonable transgression, is in the wife an overwhelming sin committed against family life. To the freedom of the male in affairs of love is opposed the strict restraint of the female, based on monogamic marriage. The sexual needs and desires of the female are transformed in an ideal manner by means of the feeling of duty of the wife and mother; the violent pressure of the sexual impulse is restrained by the opposition of ethical forces. When this restraint fails, the running off the rails that ensues has a far profounder influence in the case of the female than

of the male, an influence not limited to her own personality, but dragging down the whole family into the abyss of consequences, into the depths of moral and physical destruction.

Though in nature everywhere the same, the sexual life of woman exhibits in the various gradations of social life different outward manifestations, from the brutal sexual congress that does not greatly shun publicity, to the modern would-be philosophical free love. And throughout all variations the two darkest points remain, the illegitimate child and venereal infection, both of which entail upon the woman the most unspeakable anxieties and the greatest possible misery, whilst the man who is in either case to blame passes comparatively unscathed.

The social sexual position of woman suffers most at the present day from the mature age at which under existing social conditions men are alone able to marry and from the ever-increasing number of cases of venereal infection. In both these directions social science and medical skill must work hand in hand for the amelioration of the sexual life of woman.

On the twentieth century falls the duty of furnishing a solution for these problems. Contesting voices are heard on all sides. *Tolstoi's* rigid demand for complete sexual abstinence, the exhortation of the professors of the German universities to their students in favor of moral purity, the associations for the official prevention of venereal diseases, the agitation among young men in favor of abstinence from sexual intercourse before marriage, finally, the clamorous voices of the supporters of women's rights—all these are influences within the sphere of sexual morality which must lead slowly but surely to extensive social changes in the sexual life of women.

The discussion of the sexual life of woman, which for many centuries was concealed by a thick veil from the eyes of the profane, or was viewed only through the frosted glass of poetical metaphor, has in recent times assumed a quite revolting character. Not only have the acquired liberties and the social aims of the present day a tendency to give to women in general a freer and higher position, to emancipate them from the bonds in which owing to the conditions of family life they have so long been shackled, but some members of the women's rights party go even farther, and demand for women greater freedom in the sphere of sexual activity.

With this end in view the sexual life of woman is used as the fulcrum of the lever, and is withdrawn from the twilight into the open light of day, or indeed too often into a dazzling and altogether false illumination. Women writers especially, who have hitherto been accustomed to delude themselves and the world with sen-

sational representations of the feminine soul, of feminine modesty, and the fineness of feminine sensibility in matters sexual, now find their greatest joy in unveiling themselves and their sisters before the face of all the world, and in discussing in the plainest language the most intimate processes of the genital organs. In writings exhibiting but little good taste, though all the more temperament, they emphasize again and again one side only of the sexual life, to-wit, the sexual impulse, the force of which is intentionally exaggerated to a high degree, so that it is described as a mighty current of passion, which may with great pains be held in check for a season, but must ultimately break loose, and with devastating rage must overwhelm everything which has hitherto been regarded as discipline and good morals. Young girls, even, step down into the arena to take part in the contest concerning the reform that is to take place in the relations between men and women. Especially sensational in this connection was *Eine für Viele. Aus dem Tagebuche eines Mädchens von Vera*,¹⁸ a book which, totally ignoring the biological differentiation of the sexes and their diverse sociological course of development, goes so far as to insist that from the man entering upon marriage, as from the woman, sexual purity and virginity are to be demanded. (The heroine of the book commits suicide because her lover has in earlier years had experience of sexual intercourse.)

From a mistaken standpoint other supporters of women's rights oppose the ideal method in sex-relations, life-long monogamy, and the ideal of sexual sensibility, motherhood, and they put forward quite new sexual pretensions on behalf of women, as belonging to them by natural right. Upon these pretensions it is the duty of physicians, who truly know and truly prize womanhood, to pass their judgment, and that judgment, which will find ample justification in the ensuing descriptions of the individual phases of the sexual life of woman, is that the modern movement on behalf of the emancipation of women goes much too far. We do not, however, mean to imply that this movement is totally unjustified.

The growing girl must not, as has hitherto been the case, be kept in a state of ignorance (which is indeed in most cases apparent merely) regarding the sexual processes of her own body, she must no longer, when she asks to be informed concerning these matters, be put off with conventional lies and prevarication. But her enlightenment must not be effected in such a manner as to lead to excitement and excessive stimulation, to the awakening of slumbering feelings, and to the conversion of fantasy into a devouring flame. Sexual enlightenment must not be made an excuse for the

¹⁸ "One for Many. Leaves from the Diary of a Maiden of Vera."

unchaining of sensibility. When about to be married, a woman should certainly be instructed regarding her sexual duties and rights, and enter as one well informed into the act in which she is to play a leading part. But she ought not, with the excessive valuation of herself attained in recent times, to regard the man as her enemy, as one whom she is always justified in fighting and always ready to fight with the equal weapons of sexual transgression. It cannot be doubted that the ideal of "pure marriage" at an early age is one greatly to be prized as the foundation of a powerful future generation; but the real nature of the male must not be overlooked, nor must his sexual honor be put to too difficult a test. We regard as reasonable the modern demand of woman that in marriage her individuality should not be buried, and that space should be given for the development of her personality; but every sober-minded person will reject the "moral demand" for "ideal passion" in accordance with "entire mutual freedom" in the sexual relation between man and wife, and will regard such free love as social insanity and as a barbaric retrogression toward the rude sexual habits of savage peoples. Further, in view of the continually increasing intensity of the struggle for existence and in view of the difficulties of the task of rearing children, we cannot fail to recognize that it is not right for women to be overburdened with the task of reproduction, and that she does not live simply and solely for the bearing of children — but those rush to the other extreme who undervalue motherhood and the duties of maternity, who speak scornfully of the woman who is "a mother, and a mother only," who despise women whom they regard merely as "means for the production of children," and who employ all possible methods to free women from the pressing claims of nature and of society.

In all social circumstances and in all times the great principle of sexual morality must dominate the sexual life of woman. As the ethical characteristics of the three great epochs in that sexual life we recognize the purity of the maiden, the faithfulness of the wife, and the love of the mother. But within the limits imposed by these demands it is still possible to satisfy the modern claim for a free development of the personality, and to accommodate the circumstances of the sexual life to the individual vital needs and vital claims of the present day.

I. THE SEXUAL EPOCH OF THE MENARCHE.

(PUBERTY.)

The term *menarche* (μήν, a month, ἀρχή, the beginning) was introduced by me into medical literature to denote the period of life in which, as a sign of puberty, menstruation first makes its appearance.

The age at which this occurs is subject to variations depending upon race, occupation, hereditary tendencies, and climate; but in Germany and Austria the average age at puberty is 14 or 15, the extreme limits being 12 to 19.

Until about the age of 13, the physical differentiation of the sexes, except for the anatomical peculiarities of the genital organs, is in our climates a trifling one. But at puberty the important changes occur by which the sexes are so strikingly differentiated. Whereas in the growing boy all physical change takes the form of increasing strength and energy, in the development of the girl, we note the appearances of the rounded outlines so characteristic of womanhood. At the same time the voice alters, becoming less sharp, with a softer quality, and yet a fuller tone; and we may observe that young brunettes have commonly a contralto voice, young blondes, more often a soprano. The intellectual changes undergone by the girl at puberty are no less extensive and characteristic than the physical changes. In brief, the undifferentiated, neuter girl is transformed into a young woman, endowed with all the attributes, mental and bodily, characteristic of femininity.

As regards the age at which the menarche usually occurs, and the manner in which its occurrence is anticipated or retarded by the various influences already mentioned, the following propositions may be put forward, based on the available statistics and observations:

1. Climate is an important factor. In the torrid zone, menstruation appears at a very early age, on the average from 11 to 14; in the temperate zone, it appears later, on the average from the age of 13 to 16; in the frigid zone, later still, on the average from the age of 15 to 18. The mean temperature of the atmosphere appears to have a direct influence on the age at which menstruation begins, the hotter the climate, the earlier being the menarche. The height of the place of residence above the sea level and its distance from the coast also have a certain influence.

2. Race and constitution have a distinct influence upon the age at which menstruation makes its appearance. In women of the Semitic races the menarche occurs earlier than in women of the Aryan races. The average age at which menstruation begins is in Jewish girls, from 14 to 15; in Magyar girls from 15 to 16; in German girls from 16 to 16½; and in Slavonic girls from 16 to 17.

In general the menarche is earlier in girls of a sanguine, lively temperament and a powerful constitution than in girls of a phlegmatic temperament and a weakly constitution; further, other things being equal, menstruation appears earlier in brunettes, girls with black hair, thick skin, dark eyes, and a dark complexion, than it appears in blondes, girls with light hair, thin skin, blue eyes, and a fair complexion.

3. The age at which menstruation begins is also affected by the conditions of life and the social circumstances. In the higher circles of society, in the upper, well-to-do classes, menstruation appears earlier than among women of the laboring classes, who are compelled to strive for their daily bread. Amongst upper-class girls the menarche occurs at the age of 14 in one-fourth of their number, whereas among lower-class girls barely one-sixth begin to menstruate at the age of 14.

In large towns, again, menstruation appears earlier than in small towns, whilst in the open country the menarche is still further delayed. In the women of Paris the average age at the menarche is 14 years and 6 months, in the women of smaller French towns it is 14 years and 9 months, in French countrywomen it is 14 years and 10 months.

How far the mode of nutrition is concerned in the production of these results is not yet determined.

4. The time of the menarche appears to be influenced by inheritance to this extent, that the daughters of women who began to menstruate early begin themselves to menstruate at an early age, whereas in other families we observe that both mothers and daughters began to menstruate late. But this relation is by no means a constant one.

Ploss has collected observations made in various countries and towns regarding the age at which menstruation begins, and the mean results of these observations are given below.

The average age at which menstruation began was:

In Swedish Lapland.....	18 years,	0 months,	0 days.
In Christiania	16 years,	9 months,	25 days.
In Copenhagen	16 years,	9 months,	12 days.
In Munich	16 years,	5 months,	12 days.
In Göttingen	16 years,	2 months,	2 days.
In Vienna	15 years,	8 months,	15 days.
In Berlin	15 years,	7 months,	6 days.

In Stockholm	15 years, 6 months, 22 days.
In Manchester	15 years, 6 months, 0 days.
In Warsaw	15 years, 1 month, 23 days.
In London, between	15 years, 1 month, 4 days.
and	14 years, 9 months, 9 days.
In Paris, between	15 years, 7 months, 18 days.
and	14 years, 5 months, 17 days.
In Madeira	14 years, 3 months, 0 days.
In Montpellier	14 years, 2 months, 0 days.
In Corfu	14 years, 0 months, 0 days.
In Marseilles	13 years, 11 months, 11 days.
In Calcutta	12 years, 6 months, 0 days.
In Egypt	10 years, 0 months, 0 days.

The collective results of the investigations of French authors regarding the average age at which menstruation first appears are given in the following table:

I. IN TEMPERATE CLIMATES:

<i>Observer.</i>	<i>Place.</i>	<i>No. of Cases.</i>	<i>Average Age.</i>
De Soye	Paris	1,000	15 years, 0 months.
Dubois	Paris	600	15 years, 3 months.
Raciborski	Paris	200	14 years, 5 months.
M. Despines	Paris	85	14 years, 11 months.
Arau	Paris	100	15 years, 4 months.
Courty	Montpellier	600	14 years, 3 months.
Puech	Nîmes	941	14 years, 2 months.
M. Despines	Toulon	43	14 years, 1 month.
M. Despines	Marseilles	25	14 years, 1 month.
Puech	Toulon	144	14 years, 1 month.
Grey	London	1,498	15 years, 6 months.
Lee & Murphy	London	1,719	15 years, 6 months.
Torisiano	Corfu	33	14 years, 6 months.
Lebrun	Warsaw	100	15 years, 1 month.

from these observations we obtain an average of 15 years.

II. IN COLD CLIMATES:

<i>Observer.</i>	<i>Place.</i>	<i>No. of Cases.</i>	<i>Average Age.</i>
Ravn	Copenhagen	3,840	16 years, 9 months.
Frugel	Christiania	157	16 years, 6 months.
Dubois	Russia	600	16 years, 8 months.
Faye	Norway	100	15 years, 6 months.
Lundborg	Esquimaux	16	15 years, 6 months.
Wistrand	Stockholm	100	15 years, 7 months.

from these observations we obtain an average of 16 years and 3 months.

III. IN HOT CLIMATES:

<i>Observer.</i>	<i>Place.</i>	<i>No. of Cases.</i>	<i>Average Age.</i>
Goodeve	Calcutta	239	12 years, 5 months.
Lith	Deccan	217	13 years, 5 months.
Roberton	Calcutta	540	12 years, 6 months.
Webb	Calcutta	39	12 years, 5 months.
Dubois	Asia	600	12 years, 11 months.

from these observations we obtain an average of 12 years and 7 months.

In 6,550 cases collected by *Krieger* menstruation first appeared:

At the age of:		At the age of:	
9 years in	1 instance.	20 years in	281 instances.
10 years in	7 instances.	21 years in	111 instances.
11 years in	43 instances.	22 years in	55 instances.
12 years in	184 instances.	23 years in	15 instances.
13 years in	605 instances.	24 years in	15 instances.
14 years in	1193 instances.	25 years in	1 instance.
15 years in	1240 instances.	26 years in	4 instances.
16 years in	1026 instances.	27 years in	2 instances.
17 years in	758 instances.	28 years in	1 instance.
18 years in	582 instances.	29 years in	1 instance.
19 years in	425 instances.		

From these figures it appears that in the 6,550 cases under consideration, the age 15 was that at which the first appearance of menstruation was most frequently observed, namely in 1,240 instances, or 18.9 per cent. The age 14 comes next, with 1,193 instances, or 18.2 per cent. The case in this series in which menstruation appeared earliest, namely in the ninth year, was observed by *Mayer*, the girl being a blonde of average height, good family, and German descent; the case in which menstruation appeared latest, namely in the twenty-ninth year, was that of a woman living in Berlin, who was sickly and chlorotic up to the time of her marriage, and in whom menstruation did not appear until some years after that event.

As regards climatic influences, all the data at our disposal prove that the hotter the climate the earlier the menarche. According to *Marc d'Espine* the age at puberty varies in an almost geometrical ratio with the mean annual temperature.

The dependence of the menarche upon climatic influences is clearly shown by the statistical data collected from various regions of the world. We append the general compilation of *Gebhard* dealing with this question.

A. EUROPE.

For Europe the data furnished by *Ploss* are grouped by *Gebhard* in the following manner.

1. Northern Europe.

The average age at which menstruation first appears, according to the older statistics, is in Swedish Lapland 18, in Norway, 16.12. In Copenhagen it is 16.75, in St. Petersburg 14.5.

More recent statistics for Finland are furnished by *Engström*.

Among 3,500 women of pure Finnish descent, he found that menstruation began:

At the age of:		At the age of:	
8 years in	2 instances.	18 years in	195 instances.
9 years in	2 instances.	19 years in	91 instances.
10 years in	4 instances.	20 years in	31 instances.
11 years in	41 instances.	21 years in	8 instances.
12 years in	178 instances.	22 years in	10 instances.
13 years in	458 instances.	23 years in	2 instances.
14 years in	715 instances.	24 years in	1 instance.
15 years in	778 instances.	25 years in	0 instance.
16 years in	614 instances.	26 years in	1 instance.
17 years in	369 instances.		

Thus, in nearly half of all Finnish women, menstruation begins with the completion of the fourteenth and fifteenth years. The statistics include women of all classes of society.

At the Pirogoff Congress *Grusdoff* furnished particulars of the first onset of menstruation in Russia among 10,000 women. Menstruation began:

At the age of:		At the age of:	
9 years in	1 instance.	18 years in	910 instances.
10 years in	4 instances.	19 years in	498 instances.
11 years in	31 instances.	20 years in	183 instances.
12 years in	244 instances.	21 years in	65 instances.
13 years in	864 instances.	22 years in	19 instances.
14 years in	1641 instances.	23 years in	5 instances.
15 years in	1795 instances.	24 years in	3 instances.
16 years in	2012 instances.	32 years in	1 instance.
17 years in	1692 instances.		

In women of German race living in Russia puberty was earliest, occurring at the average age of 15.16 years; in Finnish women it was latest, occurring at the average age of 16.17 years.

2. Middle Europe.

In Germany, according to the tables of *Krieger* and *L. Mayer*, who have recorded 11,500 cases in all, menstruation begins most commonly (in 18.931 per cent. of the cases) at the age of 15; the next most frequent age is 14 (18.213 per cent. of the cases).

For Berlin, in a number of cases collected from the lower classes of society, we find the average age for the first appearance of menstruation to be 16.18 years.

Notwithstanding the more northerly situation of Berlin, the average age at puberty is somewhat less than in Munich, situated $4\frac{1}{2}$ degrees to the southward, for the reason that the retardation dependent upon altitude makes itself manifest in the latter town, which is situate about 500 metres (1,640 feet) higher above the sea level. Whereas in Berlin 18 per cent. of all cases begin to menstruate at the age of 14, and 19 per cent. at the age of 15, in Munich the two

leading years are 15 with a percentage of $17\frac{1}{2}$, and 16 with a percentage of $18\frac{3}{4}$.

In Great Britain, according to *Krieger*, the average age at which menstruation begins is 15 years, 1 month, and 5 days. For Manchester the age given is 15 years, 6 months, and 23 days. In France, according to the calculation of *Brierre de Boismont*, the most frequent age for the first onset of menstruation is 16. In Paris the average age is 14 years, 6 months, and 14 days. Bohemia, Upper and Lower Austria, and Moravia have an average age of 16 years and 2 to 3 months.

3. Southern Europe.

In Southern Europe the influence of the higher mean temperature manifests itself. The average age at which Spanish girls begin to menstruate is 12. In Northern and Middle Italy the most frequent age is 14; in Southern Italy, 13. In Lyons the average age at which menstruation begins is 14 years, 5 months, and 29 days; in Marseilles and Toulon it is 13 years and 10 months. For Hungary, *Doktor* gives the statistics of 9,600 cases. In $22\frac{1}{3}$ per cent. menstruation began at the age of 15; in $20\frac{1}{2}$ per cent. at the age of 16, and in 10 per cent. at the age of 17. The earliest age among these cases was 8 years; the latest, 33 years. (The latter must no doubt be regarded as pathological.)

B. ASIA.

In Palestine puberty most commonly occurs at the age of 13; in Turkey even as early as 10. *Rouvier* calculated the average of 742 cases observed in Syria to be the age of 12. As regards Persian women, the data vary between the age of 14 for the northern part of the country and the age of 9 or 10 for the southern. According to *Joubert's* data in 46.4 per cent. of the indigens of India, menstruation begins at the age of 12 or 13. Similar figures are given for Ceylon and for Siam. In Japan menstruation most frequently begins at the age of 14, sometimes as early as 13; mothers of 15 are by no means rarities in this country, but for menstruation to begin before the age of 12 is considered a very exceptional occurrence. According to a table dealing with 584 women of Tokio menstruation began:

At the age of:	At the age of:
11 years in 2 instances.	16 years in 228 instances.
12 years in 2 instances.	17 years in 68 instances.
13 years in 26 instances.	18 years in 44 instances.
14 years in 78 instances.	19 years in 10 instances.
15 years in 224 instances.	20 years in 2 instances.

The data available regarding China are so exceedingly variable that little importance can be attached to them.

C. AFRICA, OCEANIA, AND AMERICA.

The average age at which menstruation begins in the negro women of Africa is from 10 to 13. In Algeria puberty occurs at 9 or 10 years. Among the Australian indigens, menstruation commonly begins as early as 8 years, and at the very latest at the age of 12 years. The data available concerning the indigens of the Oceanic Archipelago are extremely variable and inexact, but we cannot go far astray in stating the age of puberty among these to be from 10 to 13. In tropical South America girls begin to menstruate from the age of 9 to 14 years. The Indian women of North America begin to menstruate at the ages of 12, 13, 14, or even as late as 18 or 20. In the Arctic zone of North America and in Greenland the onset of menstruation is delayed till 17 and even till 23 years.

As regards the position in life and the upbringing years it has been shown by numerous observers that among the well-to-do classes, whose mode of living is luxurious, and whose social circumstances allow free play to the imagination, menstruation begins at an earlier age than among the working classes, whose life is one of want and privation. According to the statistical data of *Mayer's* regarding 6,000 women, menstruation began:

	<i>In women of the upper classes.</i>	<i>In women of the lower classes.</i>
At the age of 13 years.....	11.73 per cent.	7.06 per cent.
At the age of 14 years.....	23.90 per cent.	13.33 per cent.
At the age of 15 years.....	22.83 per cent.	14.56 per cent.
At the age of 16 years.....	14.10 per cent.	16.53 per cent.
At the age of 17 years.....	9.60 per cent.	13.33 per cent.

From this table we learn that in nearly one-fourth of the girls of the upper classes puberty occurs at the age of 14, whilst in girls of the lower classes barely one-sixth begin to menstruate at this age. The average age at the first menstruation in girls belonging to the upper classes is seen to be 14.69 years, but in girls belonging to the lower classes, 16.00 years. According to other observers the average age at the first menstruation is:

	<i>Brierre de Boismont. (Paris.)</i>	<i>Tilt. (London.)</i>	<i>Krieger. (Berlin.)</i>	<i>Ravn. (Copenhagen.)</i>
Amongst gentle folk and the rich	13 y. 8 m.	13 y. 5½ m.	14 y. 1 m.	14 y. 3 m.
Amongst the well-to-do middle classes	14 y. 5 m.	14 y. 3½ m.	15 y. 5 m.	15 y. 5½ m.
Amongst the lower classes	14 y. 10 m.		16 y. 8 m.	16 y. 5½ m.

Comparative observations on women living in towns and women

living in the country show also that in the former, menstruation begins on the average at an earlier age. According to *Brierre de Boismont*, the average age at the first menstruation is:

In Paris	14 years, 6 months.
In small towns	14 years, 9 months.
In country districts	14 years, 10 months.

Similarly it was found by *Ravn* that menstruation first occurred:

In Copenhagen at the average age of.....	15 years, 7 months.
In industrial towns	15 years, 4 months.
In country districts	16 years, 5 months.

Mayer states that the average age at which the first menstruation occurs is:

In townswomen	15.98 years.
In countrywomen	15.20 years.

In Italy, according to *Calderini*, in a thousand instances, menstruation begins at the age of 14 in 280, at the age of 15 in 219, at the age of 13 in 205, at the age of 12 in 116, at the age of 16 in 89, at the age of 17 in 55, at the age of 18 in 14, at the age of 11 in 7, at the age of 10 in 6, and at the age of 20 in 6 instances. In girls attending town schools, the first menstruation most commonly occurs in the months of June and August; but in girls attending country schools most commonly in the spring months.

A certain hereditary predisposition is so far determinative in the matter of the early or late onset of the first menstruation, that from a knowledge of the age at which menstruation began in the mother, we are able with great probability to predict the age at which it will begin in the daughter. Among fifty cases which I investigated with this point in view, I found forty-one in which the daughters of mothers who had begun to menstruate early began themselves to menstruate early, usually indeed in about the same year of life; or conversely that when the mother had begun to menstruate late, late onset of menstruation was usually to be observed in the daughter also. *Tilt* relates a case in which a woman began to menstruate at the age of fourteen, and her daughter and granddaughter both began to menstruate at the same age. *Courty* observed a mother who began to menstruate at the age of eleven, and whose eight daughters all began to menstruate at the same age.

Gynecologists agree in stating that girls of sanguine temperament and powerful constitution begin to menstruate earlier than weakly and phlegmatic individuals. *Tilt* describes a peculiar ovarian temperament, in which menstruation begins early; such women have as a rule striking nervous sensibilities, with a dark complexion and glistening, longing eyes, always surrounded by dark rings.

The opinion is general that in girls with black hair, dark eyes, thick skin, and dark complexion, menstruation begins earlier than in blondes with blue eyes and delicate white skin. *Brierre de Boismont* states in this connection that not fair hair only, but also chestnut-tinted locks, indicate a late onset of menstruation. *L. Mayer* found that:

<i>Of blondes.</i>	<i>Of brunettes.</i>	
17.20 per cent.	18.84 per cent.	began to menstruate at the age of... 14
16.89 per cent.	18.02 per cent.	began to menstruate at the age of... 15
15.14 per cent.	16.59 per cent.	began to menstruate at the age of... 16

According to the same author, the average age at which menstruation begins is:

In blondes	15.55 years.
In brunettes	15.26 years.

As regards race, it is well known that in Jewesses menstruation begins at an early age. According to *Joachim* the age of puberty varies very greatly among the different races inhabiting Hungary. The first menstruation appears:

In Slavonic girls between the ages of.....	16 and 17
In Magyar	15 and 16
In Jewish	14 and 15
In Styrian ..	13 and 14

FIRST APPEARANCE OF MENSTRUATION.

The first appearance of menstruation is commonly preceded by various symptoms dependent on the increased flow of blood to the genital organs. Such symptoms are: Sacache; dragging sensation in the loins; an indefinite feeling of pressure in the lower part of the belly, especially in the region of the uterus and the ovaries, which region is sometimes also tender on pressure; a slight feeling of weariness in the lower extremities; sudden flushings or pallors; alternating sensations of heat and chilliness, sometimes accompanied by actual though slight change of temperature. In many cases also there are disturbances in the intestinal evacuations and urinary secretion, in the process of cutaneous transpiration, and in the functional activity of the gastro-intestinal canal. A frequently observed symptom is an increased irritability of the entire nervous system, with an inclination to melancholy and indefinite amorous desires — symptoms which *Tilt* denotes by the term "ovarianismus," *Emmet* by the term "erection," *Lecal* by the term "phlogose amoureuse," and the older writers by the term "molimina menstrualia."

The nervous irritability manifests itself already before the appearance of the menstrual flow by headache and moodiness, weariness,

ness, nervous irritability, and low spirits; further, by slight changes in the facial aspect, dark rings round the eyes, spontaneous blushing, uneasy sensations, epigastric pain, loss of appetite, a sensation of pressure in the abdomen, palpitation, vertigo, dragging sensations passing from the loins to the thighs, feeling of weakness and numbness in the lower extremities — symptoms which often endure for several months and in such cases tend to lower the resisting powers of the organism.

Courty enumerates as prodromal symptoms which are observed in the majority of girls before the first appearance of menstruation: swelling and tenderness of the breasts, sensation of fulness and weight in the hypogastric region, moderate intestinal meteorism, sacache, aqueo-mucous vaginal discharge, finally, an itching sensation in the genital organs. These manifestations may also assume a morbid character, taking the form of violent abdominal and lumbosacral pain, general fatigue and weakness, dyspepsia and diarrhoea, cephalalgia, various kinds of neuralgia, some degree of moral aberration. After the first menstruation, two or three months may elapse before the girl menstruates again, but after the lapse of a year the flow usually recurs at quite regular periods. Sometimes the early periods are very violent and recur very frequently, every twenty days, for instance.

The greatest increase in size and weight occurs in the female sex at the time of the menarche. Amongst the poorer classes the greatest development in size and strength occurs between the ages of 13 and 15 years, whereas in the upper classes of society, those who ultimately attain the same weight exhibit their greatest growth at the ages of 12, 13, and 14 years. According to *Pagliani* the greatest growth in the female sex always precedes puberty, so that for example a girl who begins to menstruate at the age of 12 will grow most rapidly in the year preceding this, whereas a girl who begins to menstruate at a more advanced age will not undergo her most rapid phase of growth so early as the age of 11. According to the observations of *Bowditch*, *A. Hey*, *Lombroso*, *Pagliani*, and *Ploss*, up to the age of 11 or 12 years the growth of girls exceeds that of boys, but whereas in girls growth ceases suddenly at the age of 14, in boys growth proceeds regularly up to the age of 16 years. At birth boys are on the average 1 cm. ($\frac{3}{8}$ ") longer than girls; but during puberty the female sex catches up the male in height, or even surpasses it. According to *Ploss*, a girl of 16 or 17 years is as tall as a young man of 18 or 19 years.

The earlier development of the female as compared with the male at the time of puberty is a constant phenomenon, to be observed in all races, in every climate, and in all strata of society.

According to the statistical data published by the authors just quoted, the age of greatest development in the respective sexes is:

	<i>In the female.</i>	<i>In the male.</i>
As regards weight at the age of.....	12 to 14 years.	14 to 17 years.
As regards height at the age of.....	12 to 13 years.	12 to 15 years.
As regards respiratory capacity at the age of.	12 to 15 years.	15 to 17 years.
As regards muscular strength at the age of..	12 to 14 years.	14 to 15 years.

Puberty occurs in the female on the average about two years earlier than in the male, and upon this difference the observed differences in growth also depend.

The menarche in the wider signification of the term includes the development which occurs at the time of puberty, and continues through a period of several months, and even years, before complete sexual maturity is attained; and includes also the time, which may be considerable, following the first appearance of the menses and before the regular rhythm of the menstrual function is established and the full development of the female genital organs is attained. This time, which forms a notable phase of the sexual life of woman, is characterized by great changes in the genital organs and in the vital processes connected therewith, by a strong tendency to suffer from a series of very various pathological changes and disorders of function in the principal organs, and a lessened general resisting power to disease—a change which finds its most definite expression in the well-established fact that in this period of life the mortality among females is much greater than among males of corresponding age. According to the statistical data of *Quetelet* and *Smits*, from the age of 14 to the age of 18 (the period of the menarche) there are 128 deaths of females for every 100 deaths of males; and even in the four succeeding years, from the age of 18 to the age of 22, the unfavorable conditions peculiar to sex are witnessed by 105 deaths of females to every 100 deaths of males.

Many authors draw a distinction between the age of puberty (from the Latin *pubes*, *puberis*), when the growth of the pubic hair occurs as an external sign of sexual development, and the age of nubility (from the Latin *nubere*), when the individual becomes fitted for marriage. The distinction is a partial one only, inasmuch as capacity for copulation is attained already at puberty. The law, however, maintains such a distinction, the Austrian Penal Code, for example, regarding intercourse with a female less than fourteen years old as rape, and the German Code likewise punishing carnal knowledge of a girl under fourteen.

The signs of puberty in girls were noticed and explained in very early times. From the anthropological studies of *Ploss* and *Bartels* we take the following data regarding this matter. In the Bible we read (Ezekiel, xvi, 7): "Thy breasts are fashioned and thine hair

is grown, whereas thou wast naked and bare." The early Indian physician, *Susruta*, refers only to the regular recurrence of menstruation as a sign of puberty. That a woman is menstruating may be known by the fact that her face is swollen and bright. In the Roman Empire *Justinian* ordained that all young women should be examined as to the growth or absence of the pubic hair in order to ascertain if they were ripe for marriage. The early Chinese physicians recorded that in every woman at the age of fourteen or fifteen years a monthly flow of blood from the genital organs began, the period of recurrence being thirty days. The physicians of the Talmud express themselves variously regarding puberty in women. In one place they advance as a sign of puberty the growth of the hair on the genital organs; in another they speak of the notable enlargement of the breasts, and mention as a sign of more complete sexual development that the nipples become elastic. Other Talmudists refer to the appearance of a dark brown coloration in the areola and to the enlargement of the mons Veneris as signs of puberty. Savage races regard the first appearance of the menstrual flow as the only certain sign of puberty, and among many such races this is the occasion of peculiar ceremonial rites. The attainment of puberty in savage tribes is often solemnized by the seclusion of the girls from the time of the first menstruation; they fast during the period of seclusion, which sometimes terminates in an elaborate ritual of purification.

For two reasons in particular, the period of the menarche is a time of storm and stress to women, first on account of the developmental processes in the genital organs, and secondly on account of the intellectual changes that occur at this period.

The local cause is to be found in the extensive transformation of the ovaries and the uterus, by means of which a peculiar and powerful stimulus, the menstrual stimulus, is elaborated, which has a reflex influence upon heart and brain, vascular and nervous systems, and secretory and nutritive processes. Since we know that in every premenstrual period by the growth of the follicles hyperæmia is excited in the ovary, by means of which the liquor folliculi is increased in amount, we can well understand that at the time of the menarche the ripening of the graafian follicles is accompanied by a considerable degree of hyperæmia of the ovaries and of the whole of the genital organs, now undergoing their fullest development, and we can easily see how this hyperæmia may result in manifold reflex disturbances. But in addition to these reflex disturbances, we have once more to take into consideration the as yet imperfectly known chemical processes which are associated with the ripening and development of the graafian follicles, and an abnormal course of

which may give rise to a disordered constitution of the blood, manifesting itself as chlorosis or in other ways. In connection with the growth and ripening of the ova, extensive and novel demands are made on the organism, and these may well endanger metabolic processes which are not established on a very secure foundation.

The other cause is to be found in the intellectual processes which occur at this time in the youthfully receptive, highly sensitive organ of mind, the brain. The girl growing into womanhood, who with astonishment and stress has witnessed the visible changes in her body, the outward signs of puberty, as they gradually make their appearance, receives powerful psychical stimulation which cannot fail to exercise an influence upon the entire nervous system and its complex interlacements, alike in the sensory and in the motor sphere.

The degree to which these influences radiating from the genital organs make themselves manifest is chiefly dependent upon the resisting power of the nervous system as a whole, upon the temperament, the inherited constitution, and the mode of education of the young girl. In children belonging to families noted for sensibility and irritability, in dwellers in large cities who have attended high schools for girls and have at an early age lifted the veil that covers the sexual processes, the reflex disturbances of the menarche will be more manifold and will manifest themselves with greater intensity than in children brought up in country districts, whose sensibilities are chiefly physical and whose mind is less susceptible to the influence of external stimuli.

A further important consideration is the time at which the menarche occurs, and whether on the one hand it is at or near the average age, or whether on the other, as precocious menstruation, it is unusually early, anticipating the general bodily development, or again as retarded menstruation it is unduly delayed. In some cases of retarded menstruation, the external genital organs are thoroughly well developed, and it is menstruation only that remains in abeyance; but in other cases the external genitals are also backward in development, the pubes and mons Veneris being but sparsely supplied with hair, and the breasts remaining very small.

In addition to these abnormal temporal relations of the menarche, certain other irregularities at the commencement of menstruation are worthy of note. Thus, the first menstruation may be normal, but thereafter amenorrhœa may persist for several months, or if the flow occurs it may be exceedingly scanty, or very pale in color; on the other hand, menstruation may be very profuse, lasting many days.

The environment in which the young girl is placed during the period of her sexual development has a great influence on the processes of the sexual life and on the pathological disturbances that affect these processes.

In working-class families the immoderate physical strain often thrown upon girls, in many cases continuous movements of the upper extremities whilst the lower extremities and the pelvis are absolutely quiescent, or conversely, an excessive employment of the muscles of the lower extremities — these circumstances in conjunction with insufficient nutriment, night-work, association when at work with persons of the opposite sex, and the frequent premature sexual stimulation, will combine to have a most deleterious effect.

Amongst country-folk, indeed, the girl has the enjoyment of fresh air, and as a rule nutritive food, moreover, there are not so many occasions of nervous stimulation; puberty therefore arrives more slowly and gives rise to less disturbance; but the ignorance of the girls very frequently leads to an early experience of coition, the natural and unnatural consequences of which have then to be taken into account.

Amongst the better classes of townspeople such hygienic regulations and educational measures are in common employment that young girls during the years of development usually receive reasonable care and attention—but very frequently, intercourse with older girls, association with young men, visits to theatres, evening-parties, and balls, and the perusal of stimulating literature, form unfavorable features of urban life which exercise their inevitable effects in the sexual sphere. In some cases, fortunately sufficiently rare, the stimulation of the sexual impulse and the longing for its satisfaction are so intense, that a kind of *demi-vierge* is brought into being, a young woman who is concerned only to preserve the physical token of virginity, but whose thoughts and fancies are anything but maidenly. It is to be feared that in consequence of the excessive freedom in education and the emancipated independence of feminine youth, these “half-virgins” are increasing both in number and in intensity, a fact which cannot fail to increase also the number of sexual maladies and perversions.

Anatomical Changes in the Female Genital Organs in the Period of the Menarche.

The female reproductive organs, which in childhood were in a comparatively quiescent state, now become powerfully active, as is witnessed by the changes that occur in the external genitals.

The soft, hairless vulva of the child becomes enlarged at the time of the menarche by the deposit of fat, and its substance becomes tough and elastic. Some time before puberty, fine, pale hairs make their appearance here and there, but not until puberty does the hairy covering of the pubic region become more or less thick. The growth of the denser pubic hair begins with the appearance of hairs along the middle of the mons Veneris and at the margins of the labia majora. Early sexual development is commonly indicated by an early and thick growth of the pubic hair. In the virgin this hair is smoother and less curly than in the later course of the sexual life. In certain tribes of negroes it is the custom for the young unmarried girls to shave off the pubic hair, which is not allowed to grow freely until after marriage. In some of the tribes of South Sea Islanders it is customary at puberty to tattoo the external genitals and the surrounding skin.

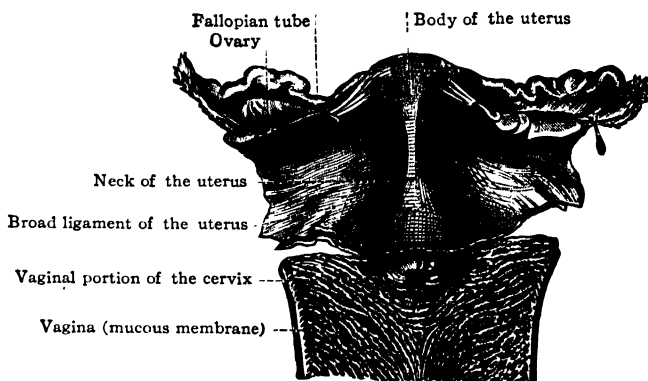


FIG. 8.—Internal genital organs of a newborn, powerfully developed female infant. (From Toldt: *Atlas of Human Anatomy*.—Rebman Company, New York.)

In young virgins the rima urogenitalis or vulval cleft is closed by the accurate opposition of the labia majora; the labia minora or nymphæ are delicate in texture, rose-red in color, hairless, free from fat, and completely covered by the labia majora; whilst the clitoris is likewise concealed. The sebaceous glands of the labia minora secrete a smegma which collects especially around the glans clitoridis, and as it undergoes decomposition diffuses a peculiar odor, resembling that of old cheese. A wing-like elongation of the labia minora in young girls, with free secretion and a generally moist appearance, leads to a suspicion of the practice of

masturbation. In the virgin the orifice of the vagina is covered by the hymen.

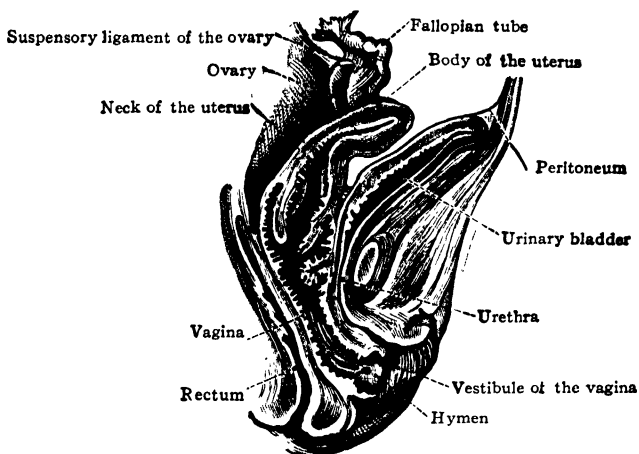


FIG. 9.— Reproductive organs of a newborn, powerfully developed female infant in median sagittal section. (From Toldt: Atlas of Human Anatomy. —Rebman Company, New York.)

The entrance to the vagina in the virgin is rounded, the posterior border of the aperture being deeply concave, whilst the anterior border is often slightly convex backwards. Where this feature is

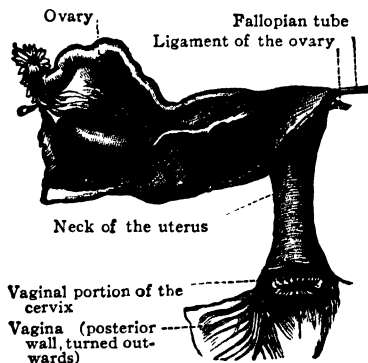


FIG. 10.— Internal genital organs of a girl aged eight years. Seen from behind. (From Toldt: Atlas of Human Anatomy.— Rebman Company, New York.)

strongly marked, the orifice has a semi-lunar shape. The posterior concave border projects forward in the form of a fold, continuous above with the posterior vaginal wall; this fold is the hymen.

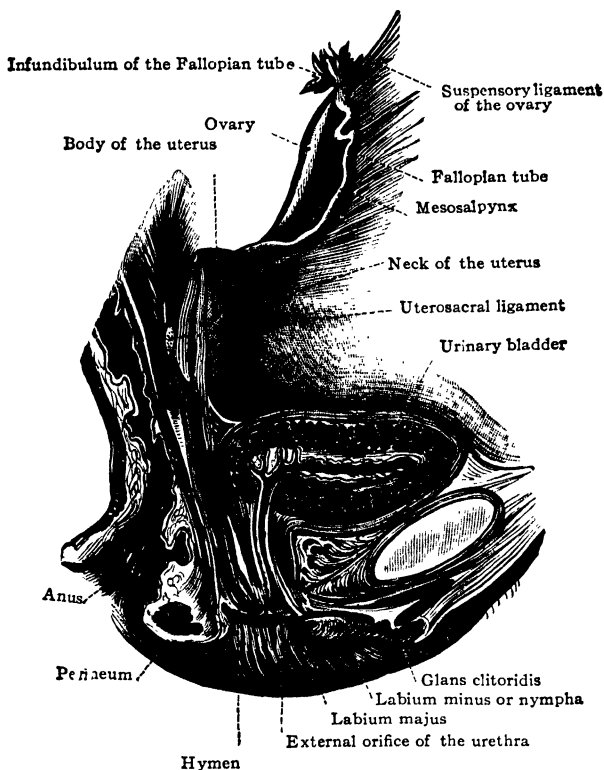


FIG. 11.—Reproductive organs of a girl aged ten years in median sagittal section. Left half. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

The infantile uterus is so proportioned that its neck (*collum vel cervix uteri*) constitutes the larger part of the organ, as much indeed as two-thirds. Owing to the small size of the body (*corpus uteri*), the whole uterus is very flat, and its borders ascend in a direction almost parallel to each other, diverging somewhat abruptly into the Fallopian tubes, recalling in some degree the two-horned embryonic form of the organ (*uterus bicornis*). The plicæ

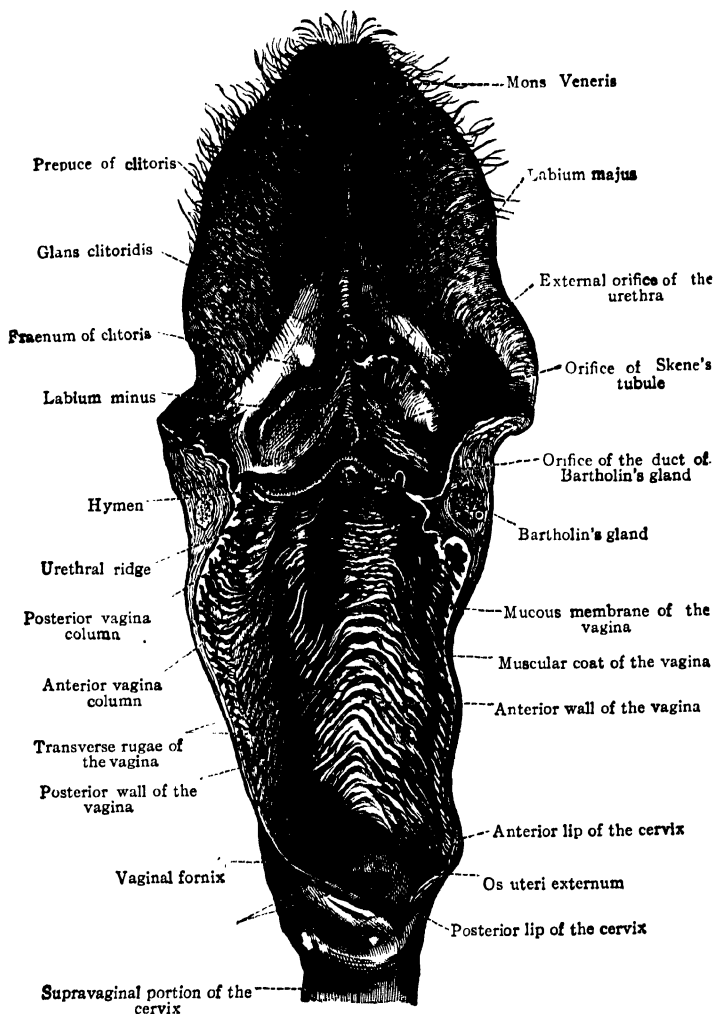


FIG. 12.—Female external genital organs of a virgin, attached to the vagina which has been isolated and opened, and a portion of the cervix uteri, Hymen, etc. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

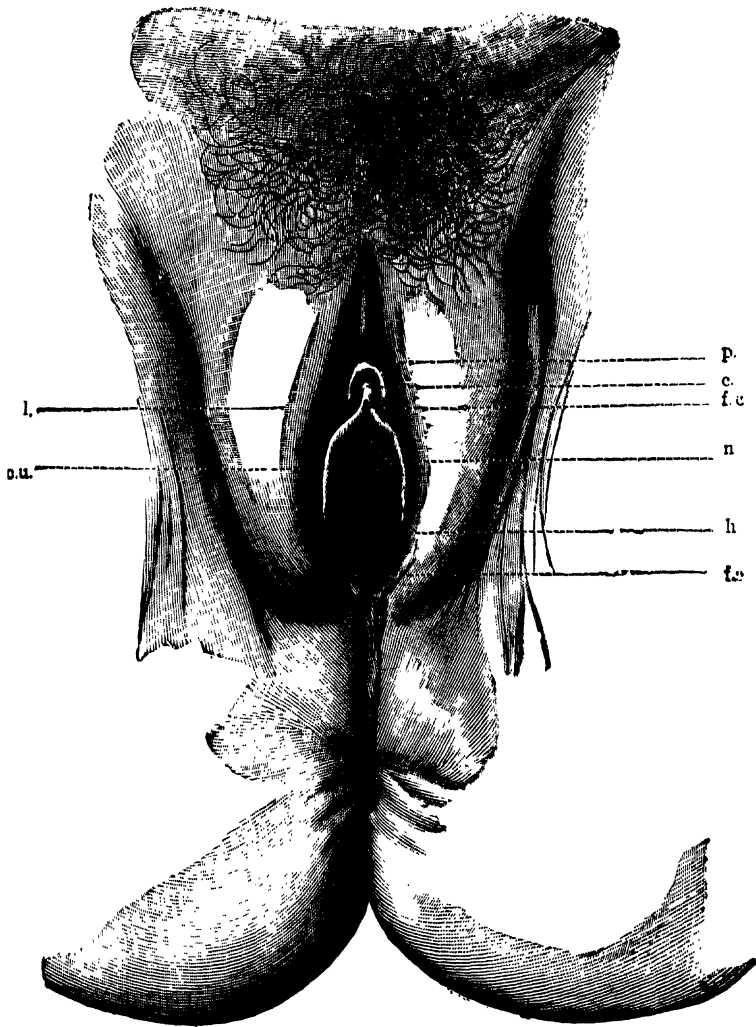


FIG. 13.—The external genital organs of a virgin, drawn apart transversely (after von Preuschen). c. Clitoris. f. c. Fraenum of the clitoris. n. Nymphae. l. Labia majora. o. u. Urethral orifice. h. Hymen. f. n. Fossa navicularis.

palmatæ on the surface of the cervical canal, which make up the *arbor vitæ uterina*, are strongly developed; the median longitudinal ridge bifurcates, and its divisions can be traced on either side into the uterine orifice of the Fallopian tube (*ostium uterinum tubæ*). The lips of the vaginal portion of the cervix are comparatively speaking very large and terminate in sharp angles. The

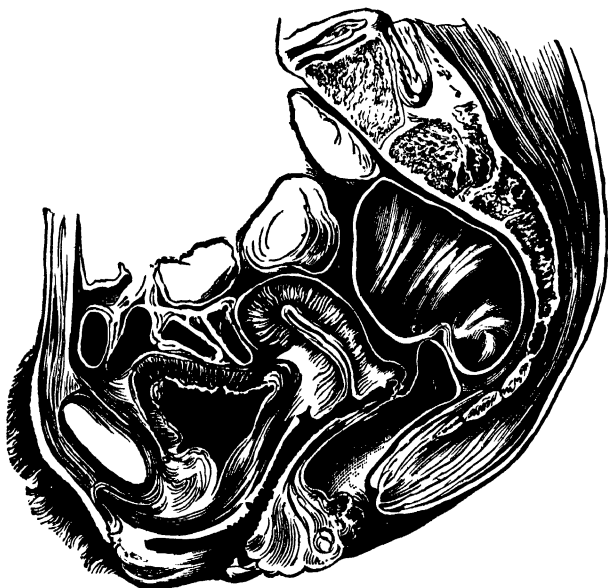


FIG. 14.—Sagittal section of the female pelvis (after Brei*el*).

vaginal mucous membrane is everywhere beset with long papillæ. The development of the uterus shortly before puberty consists chiefly in the enlargement of the body of the uterus, and the growth of its walls in thickness.

At the time of puberty, according to *Toldt*, the body of the uterus in the virgin has already increased till its length is half that of the entire organ; and at the first appearance of menstruation the body and neck of the virgin uterus are nearly equal, with perhaps a slight preponderance in size of the cervix, and the walls of the uterus have become convex. In consequence of this change the organ becomes pear-shaped, and the uterine cavity (*cavum uteri*) assumes the form of a triangle with moderately incurved sides. The cervical canal becomes wider in the middle; the margin of the *os uteri* becomes smooth and rounded. The walls of the virgin vagina

are marked with numerous dentate transverse ridges (*rugæ*), especially near the lower end and on the anterior walls, the columns of the vagina (*columnæ rugarum*), from which the transverse ridges run to either side at right angles, extend half way up the vagina, and are of a hard consistence.

The characteristic changes in the ovary at the time of the menarche originate in the changes undergone by the ovarian follicles. A large number of small separate follicles is to be found already in the ovary of the new-born infant. These structures, known as primitive follicles, are formed by detachment from the egg-tubes that grow down into the stroma from the superficial germinal epithelium; they are spheroidal vesicles, enveloped by a single layer of cubical cells, and their interior is entirely filled by the primitive ovum or egg-cell. This latter consists of very finely granulated protoplasm with spherical nucleus and distinct nucleolus, but no trace of an investing membrane can as yet be discerned. The further development of the ovarian follicles takes according to *Toldt* the following course: A rapid multiplication of the cubical cells that form the wall of the follicle occurs, so that the ovum is surrounded by two, three, or several layers of cubical or rounded cells, and the whole follicle gradually increases in size. At the same time the ovum assumes an eccentric position in the interior of the follicle. At or near the middle of the follicle a slit-shaped space now appears, filled with a clear colorless fluid. As this space gradually enlarges, the follicle¹⁹ becomes converted into a vesicle filled with fluid, the wall of which is composed of small cubical cells. Simultaneously with the growth of the follicle a lamination of the elements of the surrounding stroma takes place, so that a somewhat sharply defined capsule is formed. In this condition these glandular structures of the ovary are known as graafian follicles.¹⁹

Before puberty, these graafian follicles are small vesicles of a diameter of one to two millimetres, containing the large unicellular ova. Each of these consists of an envelope, the zona pellucida (also known as the zona radiata, or striated membrane of the ovum); an external granular mass of protoplasm, the vitellus or yolk; a vesicular, spherical nucleus, the germinal vesicle; and a nucleolus, which if single is large and prominent, the macula germinativa or germinal spot. As early as the second year of infancy every imaginable intermediate stage between the primitive follicle and the fully-developed vesicular graafian follicle can be observed.

¹⁹ It is by a certain abuse of terminology that the name *follicle* is given to these structures even before the appearance of fluid in their interior, the word *folliculus* meaning properly a *little bag* or *sack*. The author's limitation of the term *graafian follicle* to the later, full-grown stage of these structures, though historically accurate, is not usual in England. Tr.

At the time of puberty certain larger follicles are always to be distinguished, which have moved inward toward the interior layers of the ovary, whereas the smaller follicles have a more peripheral situation; thus, according to *Waldeyer*, we observe at this time in a section of the ovary, proceeding from without inward, first the epithelium, next the fibrous tunic, next the zone of younger follicles, and finally the zone of older follicles. According to *Henle* and *Waldeyer*, at the commencement of puberty, there are in each ovary about 36,000 ova, giving a total for the two of 72,000.

In the further course of development of the graafian follicles at this period, the most advanced now reapproach the surface of the ovary, so that a fully-matured follicle comes to occupy almost the entire thickness of the cortical substance, and may even give rise



FIG. 15.—Primitive follicles.

to a localized bulging of the surface of the organ. In such a mature follicle, which has attained nearly the size of a pea, we recognize an outermost connective-tissue investment (*theca folliculi*), consist-

ing of condensed ovarian stroma, in which two layers are distinguished, sometimes called simply *outer tunic* and *inner tunic*, sometimes known by the names of *tunica fibrosa* (outer) and *tunica propria* (inner), respectively; within this is the cellular layer known as the *membrana granulosa* (or *stratum granulosum*), the portion of which, now greatly enlarged, immediately surrounding the ovum is known as the *discus proligerus* (or *cumulus oöphorus*); the interspace between the discus proligerus and the membrana granulosa is filled with a clear fluid, the *liquor folliculi*. In consequence of the continued increase in its fluid contents, the graafian follicle ultimately bursts along the most prominent portion of the superficial wall, and the ovum passes out through the rupture, finding its way under normal conditions into the Fallopian tube and through this into the uterus. The follicle itself then undergoes a regressive metamorphosis, forming the *corpus luteum*, the rent in the envelope of which, after the absorption of the yellowish semi-fluid contents, undergoes cicatrization. Contemporaneously with this development at puberty of the process of ovulation, menstruation also for the first time makes its appearance, recurring thenceforward at four-weekly intervals as the regular catamenial discharge.

We append the account given by *Pfannenstiel* regarding the ovarian follicles. He writes: "In correspondence with the especial function of the female reproductive gland, which is to bring to maturity and to evacuate only after the lapse of a considerable period and at successive intervals, the ova which it has contained from the very outset, we find that primitive follicles continue to exist in the ovary up to the very end of the period of sexual activity, though naturally in diminishing numbers; and the size and shape of these primitive follicles remain nearly identical throughout the various periods of life. As the follicle ripens, the epithelium grows, the cells becoming cubical with a rounded nucleus, and increasing in number by cell-division, so that several layers are formed. As soon as these layers are three or four in number, a space, at first slit-shaped, forms in the epithelium on the peripheral surface of the ovum; this space is filled with fluid, known as the liquor folliculi; the peripheral layer of cells, the membrana granulosa, is thus separated from the mass of epithelial cells immediately enveloping the ovum, the discus proligerus, which is situate in the side of the follicle adjacent to the hilum of the ovary. By the increase of the liquor folliculi the graafian follicle is formed, a vesicle the envelope of which is formed by the multilaminar membrana granulosa, whilst in the pole of the vesicle directed toward the hilum ovarii is the ovum imbedded in the mass of cells forming the discus proligerus, a mass which has the form of a truncated cone. The liquor folliculi is formed by

the epithelium, the nuclei of which disappear by chromatolysis or by simple atrophy, whilst the cell-bodies liquefy in consequence of albuminous, not fatty, degeneration (*Schottländer*). Within the epithelium of the follicle we find the faintly glistening epithelial vacuoles of *Fleming*, likewise cells which liquefy and assist in increasing the bulk of the liquor folliculi. This liquor is a thin, serous fluid, and contains albumin. * * * Every graafian follicle has a bilaminar investing membrane, which is formed by the ovarian stroma. * * * The ovum of the growing follicle increases in size very slowly indeed, attaining on the average, according to *Nagel*, a diameter of 165 to 170 μ , it retains its zona pellucida, the greater part of the protoplasm of the cell is transformed into endoplasm (food-yolk, or yolk-granules), the nucleus assumes an eccentric position. Between the zona pellucida and the cell-body a narrow perivitelline space appears. The ovum is then full-grown, but not yet fully prepared for fertilization; for this, maturation is required, certain changes in the germinal vesicle, which occur after the bursting of the follicle. * * * As a rule each follicle contains a single ovum. But two and even three ova have beyond doubt been observed in one follicle."

According to *Waldeyer*, the bursting of the follicle is not to be regarded as dependent upon a sudden rise of pressure in its interior, but as the result of a gradual ripening process. At the deepest pole of the follicle, which in the course of its development has now approached the surface of the ovary, an exuberant growth takes place in the internal layer (*tunica propria*) of the theca folliculi, with a profuse formation of new vessels. Here numerous "epithelioid" cells, the "lutein-cells," make their appearance. In consequence of this proliferation of the lutein-cells, the contents of the follicle are gradually pressed toward the "stigma," the superficial pole of the follicle, and the follicle itself is pushed toward the surface until it finally comes into contact with the germinal epithelium. Meanwhile the follicular epithelium undergoes fatty degeneration, alike in the *membrana granulosa* and in the *discus proligerus*. In consequence of the proliferation of the lutein-cells, on the one hand, and the fatty degeneration of the epithelium, on the other, the follicle opens at its weakest point, the stigma, and the ovum is extruded, with the liquor folliculi, and a number of cells belonging to the follicular epithelium. (To illustrate these changes we have borrowed FIGS. 15, 16, and 17 from the monograph, by *Pfannenstiel* on *Diseases of the Ovary*, in *J. Veits' Handbook of Gynecology*.)

The ovaries, which in the new-born female infant are flattened, ribbon-like bodies one-half to one-centimeter (0.2 to 0.4") in length, and in childhood are cylindrical, with a perfectly smooth surface,

assume at the time of puberty a more or less flattened form. During the menarche they have an elongated oval shape, flattened from side to side, their average length being 2.5 to 5.0 centimetres (1 to 2"), width 1.5 to 3.0 centimetres (0.59 to 1.18"), thickness 0.6 to 1.4 centimetres (0.24 to 0.55"), weight 5 to 8 grammes (77 to 123 grains). After the repeated occurrence of ovulation, the surface of the ovary becomes more and more uneven, being thickly covered with fossæ or scar-like fissures.

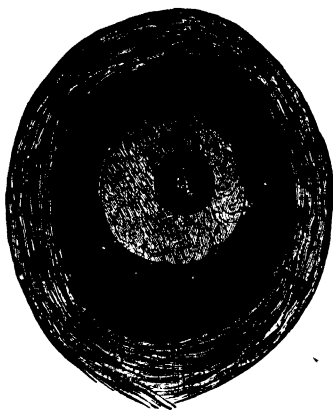


FIG. 16.—Ripening follicles.

The vagina during virgin girlhood is narrow, and its mucous surface is beset with numerous rugæ, which may be plainly felt as well as seen. The calibre of the vagina is proportionately less the younger the girl. The examining finger is gripped by the vaginal wall as by an india-rubber tube (*Maschka*). The vaginal portion of the cervix is felt in the form of a truncated cone, with a smooth surface, rather dense in consistence; the external os opens at the bottom of a small depression on its surface, in the form of a short oval, the long axis of which is transversely directed. Shortly before the menarche, Bartholin's glands become noticeable on either side of the lower end of the vagina between the sphincter muscles.

The clitoris in many cases attains a very large size, and this is apt to lead to sexual malpractices. According to *Hyril*, in southern countries the clitoris is larger than in temperate and cold climates. In the women of Abyssinia and among the Mandingoes and the Ibboes, the size is portentous, and amongst the first-named, circumcision of females is a customary operation. It is said that female slaves belonging to these races are greatly esteemed by the

ladies of the harem, and are eagerly sought for. In the anatomico-pathological museum at Prague there is a preparation of the female genital organs with a clitoris as large as the penis of a full-grown man.

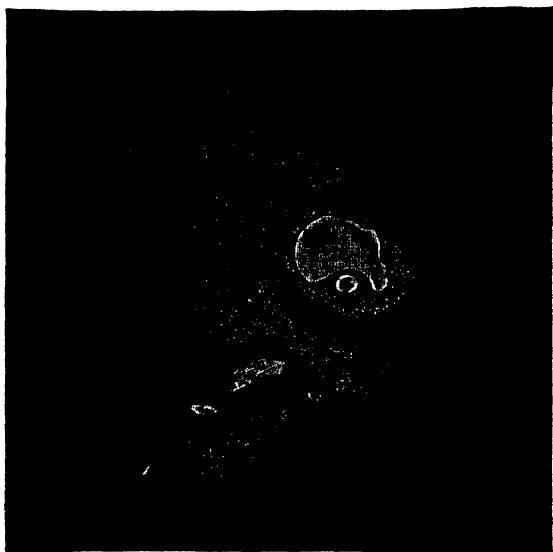


FIG. 17.—Graafian follicles.

Sonini describes "as peculiar to women of Egyptian or Koptic descent, the presence of a thick, fleshy, but soft and pendent outgrowth in the pubic region, completely covered with hair," which he compares to the hanging caruncle on the bill of the male turkey. This appendage becomes thicker and longer with advancing years. *Sonini* found such an appendage one-half inch in length in a girl of eight years, one of more than four inches in a woman of twenty to twenty-five years. Circumcision in girls consists in the removal of this outgrowth, which hinders copulation; in that part of the world the operation is usually effected in the seventh or eighth year, just before puberty.

The circumcision of girls as practiced by Mahommedan peoples in Africa is said by *Ploss* and *Bartels* to consist in abscission of the labia minora, the clitoris, and the præputium clitoridis. *Brehm* is of opinion that the object of the operation is to diminish the intensity of the sexual impulse, so overpowering among these races; but others believe that the great enlargement of the clitoris and the

labia minora usual in those countries is regarded as a serious defect in beauty, a defect removed by the operation; whilst others again hold that the circumcision is required for the removal of the hindrance to copulation presented by the abnormally large clitoris. Closely related to the operation of circumcision in females, according to *Ploss* and *Bartels*, is the custom peculiar to Africa of infibulation, wherein, after a preliminary cutting operation like that for circumcision, the fresh wound surfaces are brought into accurate opposition, either by sutures or by appropriate bandages, so that when cicatrization occurs the vulval cleft is closed except for a very small aperture. The object of infibulation is to enforce on girls complete abstinence from sexual intercourse. (Before marriage, the vulval cleft is reopened to an extent corresponding with the size of the genital organs of the future husband; and when pregnancy occurs, the opening is still further enlarged before parturition; but after that event, the wound surfaces are refreshed, and the whole opening is once more closed). On the other hand, in many savage tribes, elongation of the labia minora and the clitoris is artificially undertaken from the earliest years of girlhood, this elongation being regarded as a beauty.

The parts of the external reproductive organs of the female concerned in sexual sensation, first described as such by *Kobelt*, are already fully developed at the time of the menarche. Of these parts a small portion only, the glans clitoridis, is visible externally, surrounded by the præputium clitoridis, a prolongation of the labia minora, which passes round the front of the clitoris, and sends from each side a fine process behind the glans to become attached to its under surface, forming the frænum of the clitoris. The erectile apparatus of the external genitals is formed by the corpora cavernosa clitoridis. As two delicately constructed trabecular masses of erectile tissue, the crura of the clitoris, these are attached on either side to the inferior or descending rami of the pubic bones; at first passing upwards parallel to the bones, they subsequently curve downward as they converge and unite to form the body of the clitoris; these masses of erectile tissue embrace the sides and the front of the lower extremity of the vagina. This erectile apparatus, when the supply of arterial blood is greatly accelerated and at the same time the outflow of venous blood is diminished, becomes distended with blood, enlarged and stiffened; the process of erection plays an important part, as we shall explain more fully later, in the production of sexual excitement and sexual pleasure during the act of copulation.

In the virgin and in the earlier phases of the sexual life, the hymen is so characteristic an organ that its more minute description would seem desirable.

The hymen, a fold of mucous membrane, springing from the periphery of the vaginal orifice, separates as a perforated diaphragm the vagina from the vulva. Between the two epithelial layers of which, as a fold of mucous membrane, the hymen consists, is a supporting layer of connective tissue of variable strength; in other respects the mucous membrane of the hymen has the same structure as the mucous membrane of the vagina. On its inner surface the rugæ and folds of the vaginal mucous membrane are prolonged. The shape of the hymen is very variable; most commonly its aperture is more or less central, so that the hymen has a ringed or semilunar shape.

In the new-born female infant, the hymen has the appearance of a tubular stopper closing the lower end of the vagina; according to *Dohrn* it exhibits as a rule one of three typical forms: *Hymen annularis, denticulatus, et linguiformis*; the *annular*, the *denticulate*, and the *linguiform* (or *linguliform*) hymen. The transverse ridges on the inner surface of the hymen, prolongations of the rugose columns of the vagina, are strongly developed. During the girl's further growth, in association with the enlargement of the vagina, the hymen undergoes important changes in form and structure. Its border becomes thinner and more tense; and in the virgin at the time of the menarche, the annular hymen is the fundamental type,

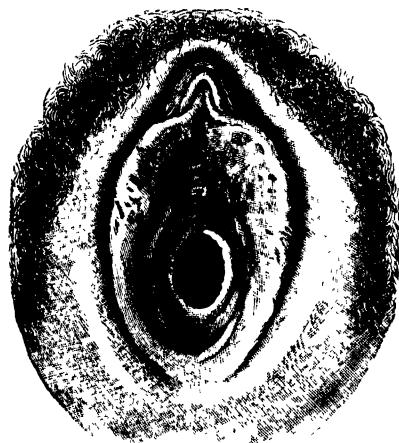


FIG. 18.—Annular Hymen.



FIG. 19.—Annular Hymen.

subject, however, to extensive variations. In most cases, at any rate, the aperture in the hymen is more or less centrally situated; very commonly, however, this opening is crescentic, when we have a

semilunar hymen, the height of the border posteriorly being much greater than anteriorly. The consistency of the hymen, its extensibility, and its thickness, are as variable as its shape.

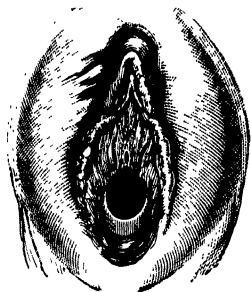


Fig. 20.—Semilunar Hymen.

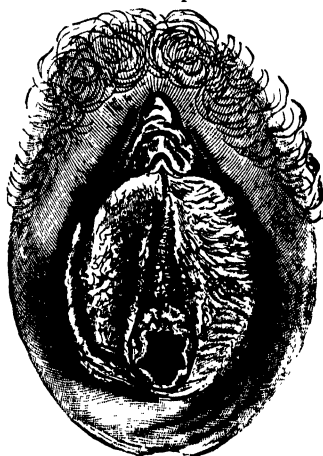


FIG. 21.—Annular Hymen with congenital Symmetrical Indentations.

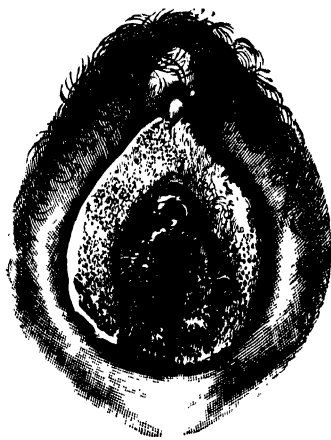


Fig. 22.—Fimbriate Hymen. FIG. 23.—Deflorated Fimbriate Hymen.

In the normal position of the reproductive organs the hymen has very rarely the appearance of a tense membrane; as a rule it

is folded up, and becomes plainly manifest only when the genital organs are stretched. The margin of the hymeneal aperture, as a close examination shows, is sometimes sharp and regular, sometimes lobulated, with small congenital notches. These congenital notches are to be distinguished from the lacerations resulting from defloration by the fact that the former have a smooth border, which is of the same consistency as the general substance of the hymen. In some instances the border of the aperture in the hymen is beset with small, fine villi (villous hymen).

The common varieties of the hymen are thus classified by *Maschka*:

1. The *annular hymen*, in which the membrane when stretched is seen to have a rounded aperture, which may be central or eccentric; very often, indeed, the aperture is more toward the upper half of the hymen, in which case it is not always circular, but frequently rather ovoid in shape.

2. The *semilunar or crescentic hymen*, in which the aperture is eccentrically placed in the upper half of the membrane, in such a manner that the hymen exhibits a wide surface below the aperture, which surface narrows at either side as it passes upwards until it disappears, the two sides failing to reunite above the aperture.

3. The *heart-shaped or cordiform hymen*, the general shape of which may be circular, ovoid, or even semilunar, but in which from the middle of the upper or lower margin a three-cornered tongue projects across the aperture, which is thus given the form of the conventional heart of a pack of cards.

4. The *infundibuliform hymen* has the form of a small projecting funnel resembling in appearance the invaginated end of the finger of a glove.

Maschka refers also to the rare condition in which the hymen is sometimes said to be absent. As a matter of fact, however, in such cases, it is represented by a very narrow annular eminence, the genitals being in other respects normal. The smooth character of the eminence will serve to differentiate it from the remains of a destroyed hymen. Other rare forms are:

1. The *imperforate hymen*, an occlusive membrane, entirely blocking the vaginal orifice. In some cases, however, the hymen is not absolutely imperforate, a very small, punctiform aperture being present.

2. The *cribriform hymen*, a hymen which is "imperforate" in the sense that there is no opening of a size approaching the normal, but in which several minute apertures are present.

3. The *septate, bridged or divided hymen* (*hymen bifenestratus*, etc.), exhibits a strip of mucous membrane, most commonly running

directly from before backward, occasionally, however, somewhat obliquely, across the aperture in the membrane, which is thus di-

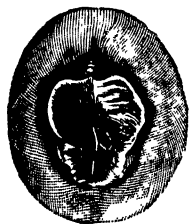


FIG. 24.—Septate Annular Hymen.

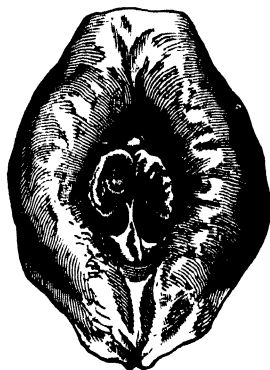


FIG. 25.—Septate Semilunar Hymen,

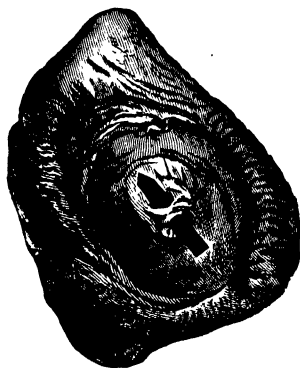


FIG. 26.—Extremely tough Annular Hymen, with an obliquely disposed Septum.

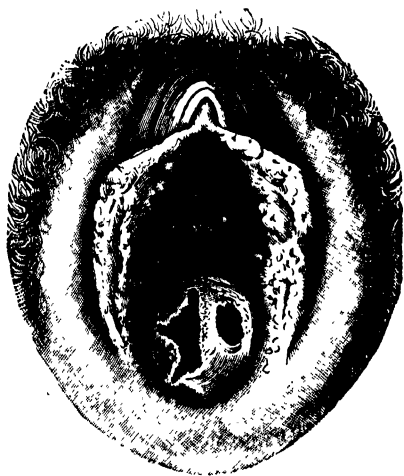


FIG. 27.—Septate Hymen with Apertures of unequal size.

vided into two equal or unequal parts. In some instances the process that bridges the aperture of the hymen is expanded in the vertical plane to form a septum which projects for some distance into the vagina.

4. The *lobate*, *lobulated*, or *labiate* hymen, which consists of several (two to four) lobes on either side, each overlapping



FIG. 28.—Septate Hymen with Apertures of unequal size.

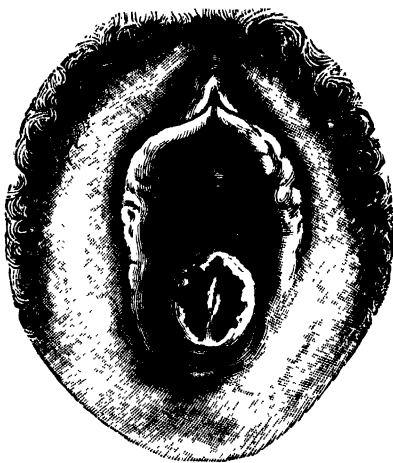


FIG. 29.—Hymen with rudimentary Septum.

the next like the tiles in a roof, whilst the aperture between the two sides has the form of an antero-posterior slit (FIG. 37); in



FIG. 30.—Hymen with posterior rudimentary Septum.

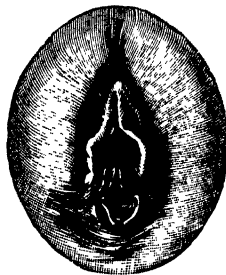


FIG. 31.—Labiate Hymen with posterior rudimentary Septum.

some cases the lobes of a lobulated hymen are so disposed that the membrane has the appearance of a fold of mucous membrane with a central furrow.

It is obvious that an imperforate or cribriform hymen, by the hindrance it offers to the passage of the menstrual discharge, is

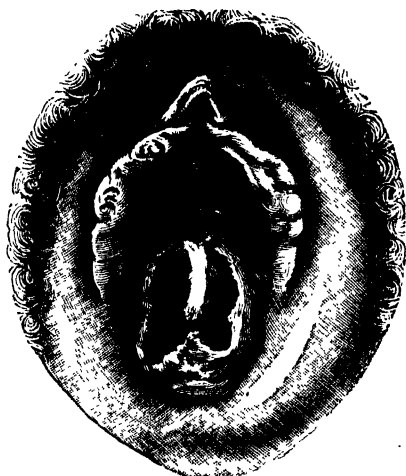


FIG. 32.—Hymen with anterior rudimentary Septum.



FIG. 33.—Hymen with anterior rudimentary Septum projecting in a opiniiform Manner.

liable at the time of the menarche, and as soon as menstruation begins, to give rise to serious disorder and to pathological states.

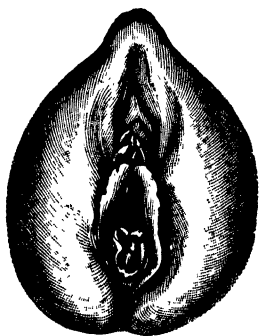


FIG. 34.—Hymen with anterior and posterior rudimentary Septa.



FIG. 35.—Hymen with filiform process projecting from the anterior margin.

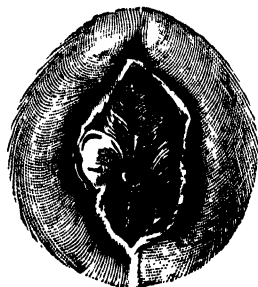


FIG. 36.—Hymen in which there are two symmetrically disposed thinned areas. The left of these is perforated.

The illustrations we append, showing the various forms of the hymen, are taken from *von Hoffmann's Handbook of Medical Jurisprudence*. (FIGS. 18-45.)

In some cases the hymen is exceedingly thin and delicate, so that it is liable to be torn if handled at all roughly; in other cases, on



FIG. 37.—Very unusual form of Hymen.



FIG. 38.—Semilunar Hymen with cicatrized Lacerations in its Border.

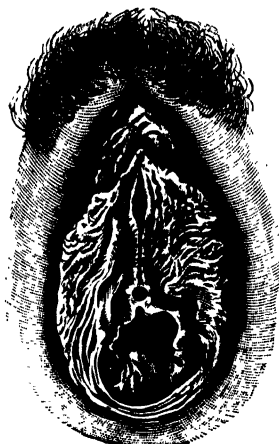


FIG. 39.—Deflorated Semilunar Hymen with laterally disposed Symmetrical Lacerations.

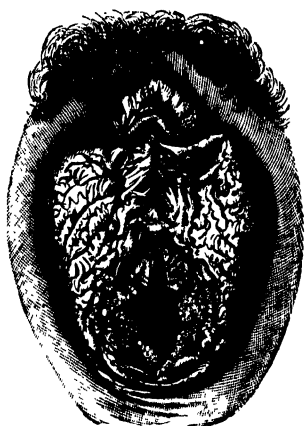


FIG. 40.—Deflorated Annular Hymen with several cicatrized Lacerations.

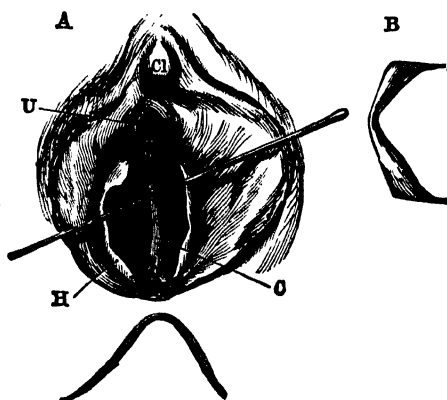


FIG. 41.—A. Septate Hymen in which Defloration has been effected through one of the Apertures. U. Urethra. Cl. Clitoris. H. Cicatrized margin. C. Septum. B. Lateral View of Septum.

the contrary, it may be very firm, thick, and fleshy, interlaced with strands of connective tissue and muscle, so that it forms a veritable cuirass for the protection of physical virginity.

As signs of virginity in the female, a knowledge of which is required, not only for the purposes of medical jurisprudence, but

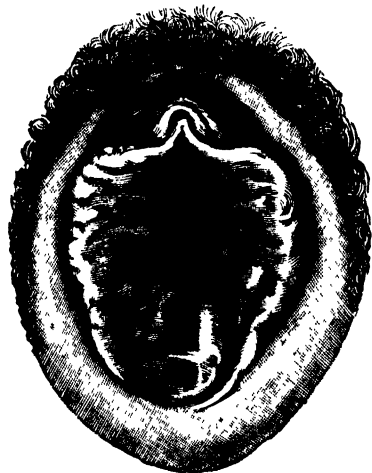
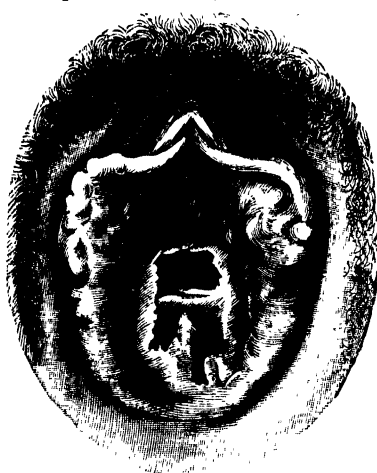


FIG. 42.—Deflorated Septate Hymen.

FIG. 43.—Hymen with larger anterior and smaller posterior Apertures.



FIG. 44.—Carunculae Myrtiformes in a Primipara.



FIG. 45.—Vaginal Inlet of a Multipara, without Carunculae Myrtiformes. Slight Prolapse of anterior and posterior Vaginal Walls

for various other reasons, we may enumerate the following anatomical characteristics of the genital organs. The labia majora are elastic in consistence and are in close apposition with one another; the labia minora or nymphæ are covered by the labia majora and are but little pigmented; the vestibule and the vaginal orifice are narrow, and the vagina itself is narrow, tense, and markedly rugose; the hymen is normal and uninjured (this, of course, is the most trustworthy of all the signs of virginity); the breasts have the virgin conformation. In opposition to the plea that the hymen can be destroyed by other causes than defloration, as by a fall, especially a fall which brings the external genitals in contact with some hard body, or by diphtheritic, variolous, or syphilitic ulceration, *Maschka* maintains that such occurrences are among the greatest rarities.

On the other hand it is sufficiently well known that the presence of an uninjured hymen affords no certain assurance of actual virginity. Cases enough are recorded, both in older and more recent medical literature, in which even pregnancy occurred in women in whom the hymen had remained intact, the explanation being that during copulation penetration of the penis had failed to occur, the semen being ejaculated on the vulva. *Scanzoni* and *Zweifel* have recorded cases in which the intact hymen offered a hindrance to parturition. The first-named author explains these occurrences by the assumption that the hymen was so stout that the penis was unable to rupture it. *Veit* remarks that both male and female youth, in these days of the continued advance of knowledge, are well acquainted with *coitus sine immissione penis*, and that very frequently a woman who is informed that she is pregnant makes answer that this is impossible, her paramour having assured her that pregnancy could not occur. On the other hand, cases are met with in which the aperture in the hymen is a very large one, so large that the penis can penetrate to the vagina without lacerating the membrane.

Brouardel reports a case of rape in which the lacerated hymen healed so completely that an expert maintained the integrity of the membrane, until another pointed out the fine scar.

In general, that we may be assured of the existence of virginity, we must find the hymen uninjured; and, on the other hand, we must regard the laceration of the membrane, unless known to be the result of gynecological examination or other manipulation, as a proof of defloration.

In ancient times among savage races the integrity of the hymen was prized as a proof of virginity, and in the Bible also great stress is laid on this sign in connection with defloration, and its absence was even regarded as a ground for the death punishment (Deut.

xxii, 21). But amongst other races the hymen was held in no particular esteem as a token of virginity.

In ancient times, and even at the present day in the Philippine Islands, the Ladrone Islands, and certain other islands of the Polynesian Archipelago, also among many African tribes, the right of defloration belonged, not to the bridegroom, but to every man belonging to the same tribe; sometimes on the bridal night all the men of the tribe had access to the bride, the bridegroom coming last, but thenceforward having undisputed possession of his wife.

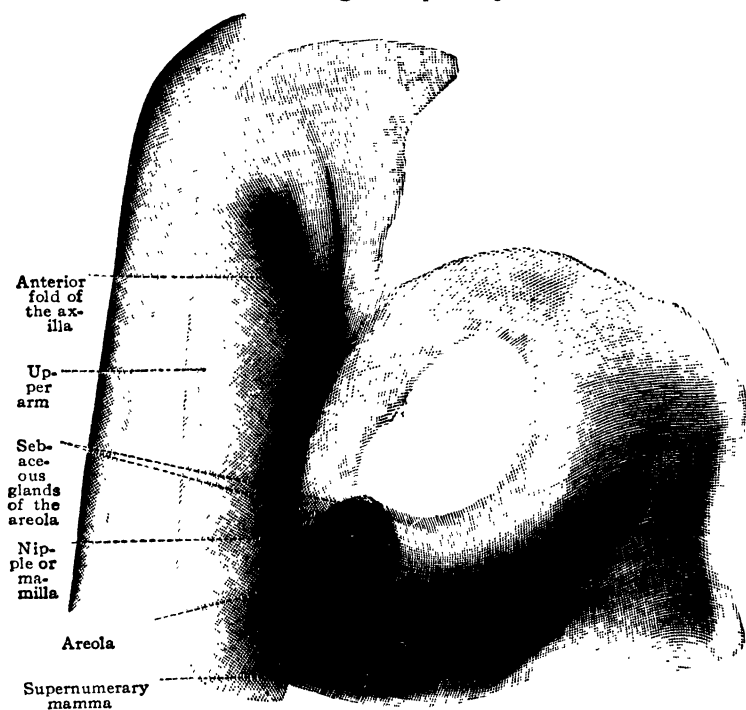


FIG. 46.—Mamma, the breast of a virgin aged eighteen years. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

Amongst certain other tribes a similar custom prevails, differing however in this respect, that the rite of defloration is performed by a priest or by one of the chiefs of the tribe. In mediæval Europe, again, the great landed proprietors exercised the well-known *jus primæ noctis* or *droit du seigneur*.

In girls at the time of the menarche who have long practiced masturbation, some of the following indications of the habit will

be found: Elongation, redness, and general enlargement of the clitoris; elongation and thickening of the nymphæ, which are also of a tough consistency and deeply pigmented; flaccidity of the labia majora; redness of the vaginal orifice; flaccidity of the hymen, which also may exhibit lacerations, caused by the forcible introduction of the finger or of some hard foreign body.

Not until the time of the menarche do the breasts attain the hemispherical form which constitutes one of the graces of young womanhood, and at the same time these organs assume a firm, elastic consistency; their size of course varies in different individuals. The nipple now has a rose-red color, darker in brunettes than in blondes; it is usually small, sometimes quite inconspicuous, being withdrawn into a cutaneous furrow. The two breasts when regarded from the front are seen to diverge from the longitudinal axis of the body. In some cases even in childhood, before the time of the menarche, the breasts are powerfully developed, being as large as an apple or larger. This depends on climate, race, and sexual excitement; as regards the last of these, early sexual stimulation promotes premature mammary development.

Although it is unusual for any secretion to appear in the mammary gland before the occurrence of pregnancy, cases have certainly been observed in which the breasts of virgins secreted a milk-like fluid, especially in consequence of sexual excitement or during menstruation. Thus *Maschka* observed in a girl the condition of whose genital organs showed her to be a *virgo intacta* that pressure on the breast caused a few drops of an opalescent fluid having the appearance of milk to exude from the nipple. She acknowledged that amatory relations had long subsisted between her and a lover who was in the habit of handling her breasts, and that this always produced strong sexual excitement. *Hofmann* also reported that in two virgins who died during menstruation he was able to express a drop of milk from the breast.

The most important indication of the general changes occurring in the external and internal genital organs, the proof that the young woman has become fitted for the fulfilment of her reproductive vocation, is the appearance of menstruation, a sanguineous discharge from the genital organs recurring every four weeks as the external manifestation of the internal process of ovulation.

The anatomical changes that have already been described as occurring in the genital organs at the time of the menarche will serve to elucidate the numerous reflex processes that manifest themselves at this period of life in so many departments of vital activity.

It is especially the extensive developmental processes in the ovary, influencing the nerves of that organ, which give rise to centri-

petal stimuli and evoke reflex manifestations. In the working of the circulatory system, such influences are apparent; and during the menarche, some time already before the first onset of menstruation, variations occur in the blood-pressure, and these during menstruation take the form of a typical undulatory curve.

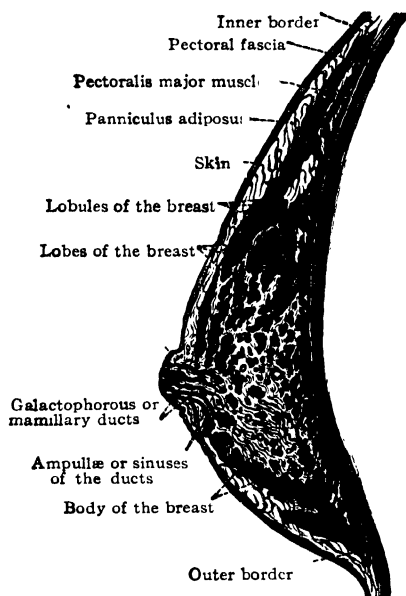


FIG. 47.—Horizontal section through the female breast. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

Thus it becomes comprehensible that even in healthy girls, the first appearance of the catamenia and likewise the expectation of the flow induce a certain modification and alteration in the whole nature and disposition. Girls often lose their previous cheerful and lively character, becoming quiet, self-absorbed, sometimes even melancholy; they are disinclined for study, have a repugnance to all sustained physical or mental activity, become annoyed and snappish on slight occasion, are restless at night, consider themselves to be ailing, and so on. During the first menstruation girls commonly appear pale and anxious, they have blue lines beneath the eyes, the face has a tired aspect, the movements lack energy, and a general want of tone combined with an abnormal irritability may be noticed. Some days before the first menstruation, the vulva, the labia majora

and minora, and the vaginal mucous membrane, are swollen, the clitoris becomes conspicuous in consequence of erectile processes, a slight secretion appears in the genital passage, and the breasts become sensitive and slightly turgid. The urine deposits a thick sediment, and occasionally severe strangury is observed. In many cases, also, digestive disturbances occur, loss of appetite, constipation, or a tendency to diarrhœa.

The first menstruation usually lasts four or five days. On the first day the discharge is blood-stained mucus, thereafter becoming sanguineous. In some cases, the bleeding at the first menstruation is profuse and of long duration.

It is not always after the first menstruation that the subsequent discharges follow at the regular intervals of four weeks. In delicate, anæmic girls the second menstruation may not occur till several months have elapsed after the first; less often the second menstruation ensues a fortnight after the first, or even earlier.

At the time of the menarche the sexual impulse, which has hitherto been dormant, becomes strongly developed. It is evoked at this time of life by the anatomico-physiological changes undergone by the reproductive glands; the stimulus aroused by these processes in the ovary, being conducted to the brain, awakens passion. At the same time the observation of the growth of the hairy covering on the genital organs, the development of the breasts, and the appearance of menstruation, tend to arouse erotic presentiments. The reading of romances, conversations with female friends, and observation of the conduct of full-grown persons, convert these presentiments into clear ideas, and excite the impulse to the production of passionate sexual sensations, the sexual impulse. How far these stimuli arising from the reproductive apparatus are encouraged and accentuated, on the one hand, or repressed and diminished, on the other, depends on external impressions of various kinds. The environment is the determinant for the further transformation of the as yet undifferentiated sexual impulse into the fully-developed copulative and reproductive impulses.

In his work on the *Physiology of Love*, Mantegazza describes the yearning and stress of the awakening sexual life, arising out of the presentiments, hazy sensations, and impulses, which are felt in the very earliest period of the developmental phase known as puberty.

In general, in a young girl during the menarche, the sexual impulse manifests itself rather in the form of semi-conscious reverie, of platonic love. The adolescent girl exercises her imagination with the circumstances of her chaste love, her mind turns to this subject when in solitude, her mood is apt to become melancholy, and it is the perusal of equivocal novels, or the educational assistance of

sexually experienced female friends, that transforms the sexual impulse to a vivid flame.

Some authors believe that a sign of the awakening of the sexual impulse when directed toward some particular man is a change of color on the part of the girl when she sees this individual or hears him spoken of. Palpitation of the heart comes on, the pulse is increased in frequency, the respiration also, and the voice fails. In this manner, it is asserted, *Galen* discovered the love of a Roman lady, *Justa*, for the dancer, *Pylades*.

The psychological reaction of the sexual impulse at the time of puberty manifests itself, as *von Krafft-Ebing* points out, in manifold ways, common to all of which, however, is the emotional state of the mind, and the need that the strange and new feelings now experienced should find some objective centre of interest. Such objective and emotional interests lie ready to hand in religion and poetry, both of which, after the period of sexual development is at an end, and the originally incomprehensible desires and impulses have received an explanation, continue to have intimate relations with the world of sexual experience. Any one who doubts this must be reminded of the frequency with which religious fanaticism makes its appearance at the time of puberty. No less influential is the sexual factor in the awakening of æsthetic feelings. This world of the ideal opens itself at the time when the development of the sexual processes begins. * * * The love of early youth, continues *von Krafft-Ebing*, has a romantic, idealizing tendency. In its first manifestations it is platonic, and willingly exercises itself in poetry and history. But as the sensibility awakens, the danger arises that this passion, with its idealizing power, will be transferred to persons of the opposite sex who in intellectual, physical, and social relations are by no means all that could be wished. Hence proceed misalliances, elopements, and seductions, with the entire tragedy of impassioned love, which conflicts with the dictates of morality and convention, and sometimes finds its bitter end in suicide or a double self-destruction. Love in which the senses play too prominent a part can never be a true and lasting love. For this reason, first love is as a rule very transitory, since it is in most cases no more than the first flare of passion. * * * Platonic love is a thing without existence, a self-deception, a false description of sexual sensations.

Bebel remarks that the number of suicides among women of the ages of sixteen to twenty-one years is an exceptionally large one, and he refers this chiefly to unsatisfied sexual impulse, unfortunate love, secret pregnancy, and to betrayal by men.

MENARCHE PRÆCOX ET TARDIVA.

(Precocious and Retarded Menstrual Activity.)

By the term *precocious menarche* we understand the pathological state in which a typical, four-weekly, sanguineous discharge from the female genital organs sets in at an abnormally early age, and is to be regarded as a symptom of a premature sexual development. Very commonly such children with precocious menstruation and premature sexual development, exhibit a comparatively high body-weight, great development of fat, early dentition; they look older than their years; and they have genital organs that also develop very early, with hair on the pubes and in the axillæ; the labia majora and the breasts resemble those of full-grown women, and the pelvis also has the adult form. Commonly also the sexual impulse develops early, whilst, in other respects, the intellectual development lags behind the physical. It is most probably a primary hyperplasia of the ovaries that gives rise to precocious menstruation, the ovarian follicles ripening earlier than usual. Frequently other pathological processes are associated with this early sexual development, such as general lipomatosis, rachitis, and new growths of the ovaries. In several cases of this nature, early conception has also been observed. According to oriental tradition, Khadijah was married at the age of five years to the prophet Mohammed, who cohabited with her three years later.

Even if we except those cases in which in earliest infancy there is a sanguineous discharge from the vagina which remains, however, an isolated occurrence, or if repeated is repeated a few times only and at quite unequal intervals (cases in which the bleeding cannot be regarded as menstrual — such, for instance as were reported by *Eröss* of six new-born female infants in whom a sanguineous discharge from the vagina appeared three or four days after birth and lasted two to five days, the infants not remaining subsequently under observation),—numerous well-authenticated cases yet remain in which menstrual hæmorrhage was observed before the end of the first year of life. One case, even, is recorded by *Bernard* in which from the time of birth to the twelfth year menstruation with molimina occurred every month, lasting two days; from the twelfth to the fourteenth year menstruation ceased, recurring subsequently at irregular intervals.

In the recorded cases of such precocious menstruation the menstruation recurred as a rule at regular intervals of four weeks; only in quite exceptional cases were the intervals three to five months.

Some of the most striking and well-authenticated cases of precocious menstruation recorded in the recent literature of the subject are appended.

Observed by *Comby*s: A girl aged 6 years and 2 months had the appearance of a girl aged 14 or 15; she was a brunette, 3' 10½" in height, with full, firm, rounded breasts, girth of chest 28½", mons Veneris covered with hair, uterus normal on rectal examination, hymen intact; menstruation had occurred regularly since the second year of life. Mother and five sisters began to menstruate between the ages of twelve and fourteen. General condition good.

Case recorded by *Diamant*: A girl aged 6 years, weight 75 pounds, thighs, buttocks, and breasts developed like those of a sexually mature woman, axillæ and mons Veneris covered with hair. Menstruation began at the age of 2 and recurred regularly, the flow lasting 4 days.

Case recorded by *Plyette*: A girl with precocious physical development began to menstruate in the fourth year of life; menstruation continued regularly with the exception of two monthly periods, when vicarious epistaxis occurred.

From the collection made by *Gebhard* of the records of fifty-four cases of precocious menstruation, giving the first appearance and the type of menstruation, the development of the breasts, the other signs of premature sexual development, and any complications that may have been observed, we extract the age at which the first menstruation occurred. This was:

In a new-born infant in.....	1 case.
At the age of 2 weeks in.....	1 case.
At the age of 2 months in.....	1 case.
At the age of 3 months in.....	1 case.
At the age of 4 months in.....	1 case.
At the age of 5 months in.....	1 case.
At the age of 7 months in.....	1 case.
At the age of 9 months in.....	4 cases.
At the age of 10 months in.....	2 cases.
At the age of 12 months in.....	5 cases.
At the age of 15 months in.....	1 case.
At the age of 16 months in.....	1 case.
At the age of 18 months in.....	2 cases.
At the age of 19 months in.....	1 case.
At the age of 22 months in.....	1 case.
At the age of 2 years in.....	4 cases.
At the age of 2½ years in.....	1 case.
At the age of 2 years and 9 months in.....	1 case.
At the age of 3 years in.....	6 cases.
At the age of 3½ years in.....	1 case.
At the age of 4 years in.....	4 cases.
At the age of 4 years and 3 months in.....	1 case.
At the age of 5 years in.....	1 case.
At the age of 5½ years in.....	1 case.
At the age of 6 years in.....	1 case.
At the age of 6½ years in.....	1 case.
At the age of 7 years in.....	3 cases.
At the age of 9 years in.....	2 cases.
At the age of 11½ years in.....	1 case.

From this collection of *Gebhard's* we learn that in one case menstruation already existed at birth, and that in a large number of cases it occurred before the expiration of the first year. In many cases the development of the breasts preceded the appearance of menstruation, and was noticed from the time of birth. The vulva also early exhibited the characteristics seen in the sexually mature woman. Further, a high body-weight, great development of fat, and early dentition, were usually seen in these cases, in which, however, the intellectual development was not in correspondence with that of the body.

In several of these cases of premature puberty, moreover, sexual intercourse and even parturition occurred at a very early age. A girl in whom menstruation began at the age of one year, gave birth to a child when she was ten years old (*Montgomery*). A girl who began to menstruate at the age of nine years, became pregnant very shortly afterward (*d'Outreport*). The well-known case recorded by *Haller*, in which at birth the pubic hair was already grown, and in which menstruation began at the age of two years, was also one of very early pregnancy, the girl giving birth to a child when nine years old. Another girl in whom at birth the pubes were already covered with hair began to menstruate when four years old, copulated regularly from the age of eight, and at nine years became pregnant, and was delivered of a vesicular mole with an embryo (*Molitor*). A girl began to menstruate at the age of two, had a growth of hair on the pubes and developed mammæ at the age of three, and became pregnant at the age of eight (*Carus*). With these cases must be classed that observed by *Martin* in America of a woman who was a grandmother at the age of twenty-six. *Lantier*, in his *Travels in Greece*, speaks of a mother of twenty-five with a daughter of thirteen.

Observations made by *Kussmaul* and by *Hofmeier* prove that in many cases changes in the ovaries form the probable cause of precocious menstruation and the other phenomena of premature puberty. In one case of *Hofmeier's*, for instance, of a girl of five with precocious menstruation, the removal of a rapidly growing ovarian tumor was followed by the cessation of menstruation, and the pubic hair, which had been shaved off, did not grow again.

Abnormally early puberty related to the early practice of sexual intercourse is seen in many prostitutes. This is shown by the following figures relating to 150 prostitutes in Russia. Sexual intercourse began :

In 1 prostitute at the age of.....	9 years.
In 1 prostitute at the age of.....	10 years.
In 4 prostitutes at the age of	12 years.
In 12 prostitutes at the age of.....	13 years.

In 14 prostitutes at the age of.....	14 years.
In 33 prostitutes at the age of.....	15 years.
In 36 prostitutes at the age of.....	16 years.

Thus, among the 150 prostitutes, 65 were less than 16 years of age.

Parent-Duchatelet found among 3,517 prostitutes under official observation, 5.6 per cent. under 17 years of age. There were:

2 prostitutes under 10 years of age.	20 prostitutes under 14 years of age.
3 prostitutes under 11 years of age.	51 prostitutes under 15 years of age.
3 prostitutes under 12 years of age.	111 prostitutes under 16 years of age.
6 prostitutes under 13 years of age.	

Martineau's observations also showed that in nearly all prostitutes the first coitus took place in very early youth. Of 607 prostitutes there were 489 in whom defloration had occurred between the ages of 5 and 20 years. According to *Grimmaldi* and *Gurrieri* defloration usually takes place in prostitutes before they attain the age of 10 years.

Sometimes we find increased sexuality in early life as a pathological manifestation — psychopathia sexualis. Thus, *Esquirol* records the case of a little girl aged four years who undertook improper manipulations in association with little boys. A female prisoner, *Lombroso* writes, had at the age of six years practiced mutual masturbation with her brother aged seven, and at the age of eight years underwent defloration; another murderess, while still a schoolgirl, had conducted herself after the manner of an experienced prostitute. *Laurent* reports the case of a girl who from the age of ten was engaged in sexual malpractices with her brothers and sisters, and finally underwent defloration at the age of fifteen.

In many cases premature sexual development is manifested by enlargement of the breasts and growth of the axillary and pubic hair, and yet menstruation fails to appear. Thus, *Kussmaul* has observed girls who while yet children exhibited all the external characteristics of sexually mature women, but who had not yet begun to menstruate. *Ploss* has published a photograph showing in a girl five years of age the mons Veneris and the labia majora developed like those of a full-grown young woman, and covered with long thick hair; in this case, however, not only had menstruation not yet begun, but the breasts were still in the infantile condition.

The opposite state to menarche præcox is that in which the first appearance of menstruation is unduly delayed; it may be even till after the age of twenty. Such a postponement of the menarche sometimes occurs in girls who exhibit at this period of life an extraordinarily great general fatty development of the body, or a notably severe chlorotic state of the blood, or in whom during the years of

development some sudden and extensive change in the mode of life has occurred, as for instance when the girl's place of residence has been removed from the country to the town, or when she has had to undertake some completely new kind of physical or mental work. *Raciborski* attributes the late appearance of menstruation, at the ages of 20, 22, 24, or 26, in otherwise healthy girls, to an "apathy of the sexual sense," a phrase which does not convey much meaning.

According to *Marc d'Espine*, puberty occurs early in girls with dark hair, grey eyes, a delicate white skin, and of a powerful build; late, on the other hand, in girls with chestnut hair, greenish eyes, a coarse darkly-pigmented skin, and of a delicate weakly build.

The genitals of girls in whom the first appearance of menstruation is delayed, frequently exhibit distinct signs of the backwardness of the reproductive organs in their development. The external genitals, in such cases, have little if any covering of hair, and are flabby and relaxed; the body and the fundus of the uterus are shorter and more slender than usual, the uterus as a whole is small and flaccid, sometimes anteflexed; the vaginal portion of the cervix is small, often almost undeveloped, its anterior lip barely projecting above the surface of the vaginal fornix; the vagina is usually short and narrow. The ovaries also are flaccid and inelastic, and occasionally are remarkably small. The breasts are small, the nipples and areolæ undeveloped.

In other cases, notwithstanding the delay in the appearance of the menarche, the genital apparatus is developed to a degree quite in correspondence with the age, but some pathological condition is present, for instance, the mucous membrane secretes excessively, exhibits a catarrhal tendency, there are erosions at the os uteri, etc.

PATHOLOGY OF THE MENARCHE.

A series of disturbances of function and pathological changes in the organs may occur at the time of the menarche, either directly connected with the genital organs, or etiologically dependent upon the changes occurring in these organs.

The commencement of menstruation, as we have already mentioned, may itself be abnormal in character, being either precocious (menarche precox), or retarded (menarche tardiva). But even where menstruation begins in a normal manner, the period of the menarche may be disturbed by a great number of pathological phenomena, of which the developmental processes occurring in the genital organs of the young girl must be regarded as the cause. First of all, the menstrual hæmorrhage itself may be abnormal in amount and duration. Then, again, functional disturbances of the most various character may occur: especially prominent are, dis-

turbances of hæmatopoiesis, of the cardiac functions, and of the nervous system, and constitutional anomalies, which deserve attentive consideration; in addition we have to mention disorders of digestion and disorders of the sense-organs, among which latter certain changes in the skin especially deserve attention.

The diseases of the female genital organs at the time of the menarche are very various in nature. Whereas during infancy and early childhood the uterus and its annexa are in a state of complete quiescence, so that nothing occurs in them to attract attention, at the approach of puberty these organs emerge from obscurity, and the percentage of diseases of the reproductive organs suddenly rises to a great height. In very young girls, among diseases of these organs, we observe only malformations, malignant tumors, and gonorrhœal infections, and these pathological states, even, are quite rare; but at puberty all this is altered, and we have to do with disturbances of the menstrual function and their consequences, and with various inflammatory processes, and the period of sexual maturity offers us an overplus of diseases connected with the reproductive system, justifying the epigram of the French gynecologist who defined a sexually mature woman as "*un uterus servi par des organes.*"²⁰

Anomalies of Menstruation.

Not infrequently, though the catamenial flow has appeared at the usual age and has for a time been regular, pathological disturbances of this function ensue.

Amenorrhœa at the time of the menarche may depend on complete aplasia of the ovaries, associated with a rudimentary and imperfect development of the uterus. In such girls, the development of whose reproductive system is thus imperfect, the continually expected menstrual flow fails to appear, in spite of the fact that a recurrent menstrual discomfort, evoked by the congestion of the genital organs, recurs at intervals of four weeks; as, for instance, colicky pains in the abdomen, irritable, nervous states, and mental disturbances. Further, amenorrhœa may be due to one of the various forms of atresia of the genital organs, as for instance to vaginal or hymeneal atresia. In such individuals the first period passes by without anything to attract attention. But at the second period, distress will usually be manifested; and from this time forward, painful contractions of the uterus will continue to occur at four-weekly intervals, and to become more violent as period succeeds period, whilst the menstrual discharge is wanting, or, to speak strictly, fails to find an outlet. The blood collects behind the seat of atresia, and the accumulation gives rise to pressure symptoms

²⁰ "A uterus served by organs."

affecting the bladder and the rectum, and ultimately also the sacral nerves.

Menstruation, after its first appearance in normal fashion, may be suppressed in young girls in consequence of mental impressions, such as sudden fright; such cases are observed after an escape from a fire, or after a railway accident. Mental stimuli of less intensity but longer duration have a similar effect; sometimes these take the form of auto-suggestion. A well-known instance of the latter phenomenon is furnished by the case of a girl who, in consequence either of actual intercourse or it may be merely of too intimate an embrace with a man, fears she has become pregnant, and actually suffers from amenorrhœa though pregnancy does not really exist. I saw a case in which amenorrhœa was thus produced in a girl seventeen years of age, whose ideas on the process of sexual intercourse were still far from clear. She had permitted a young man to kiss her repeatedly and fervently, and to clasp her in a close embrace. She was then afraid that she had become pregnant; the catamenial flow, which had been regular since she was fifteen years old, ceased to appear; and it was not until at length I was consulted, was able to assure myself that the girl was essentially virgin, and was, therefore, in a position to reassure her as to her own condition, that menstruation again became regular.

Functional amenorrhœa may also occur in young girls in consequence of a sudden change in the conditions of life, a removal from town to country, for instance, or the reverse, travel in regions where the climatic conditions differ widely from those hitherto experienced, or a change from an active to a sedentary kind of occupation. Of this nature is the following case observed by *Winter*: Miss Q., aged 20; menstruation began at the age of 13 and was regular thereafter; on three successive occasions amenorrhœa occurred during a visit to Berlin, in one case lasting 3 months, another 2 months, and a third 6 weeks, whereas when at home menstruation was regular though somewhat scanty. There were no molaria. Examination showed the wall of the uterus to be thin, length of this organ 7 centimetres ($2\frac{3}{4}$ "), both ovaries distinctly palpable. Such a form of amenorrhœa as this, commonly disappears when the girl removes from the conditions unfavorable to the fulfilment of her sexual functions to the conditions favorable to that function.

Not infrequently a chill is in young girls the cause of suppression of the menstrual flow that has hitherto been quite regular, especially effective in this respect being, standing in cold water, getting the feet wet, the influence of rain and wind at the menstrual period on the insufficiently clothed lower extremities, and vaginal injections with water at too low a temperature. Such cases are common

among the working classes, especially in washerwomen; but they are also observed among the well-to-do. An example is given by *Winter*: Miss H., aged 19; menstruation began at the age of 13, regular, at intervals of 4 weeks, the flow lasting 2 to 3 days, and being normal in amount. Several years ago the patient caught a severe cold through paddling in cold water during the period. Suppression of the menses resulted, amenorrhœa being complete for a year and a half. Then menstruation recommenced, but was irregular, sometimes anticipating, sometimes postponing the proper period, the interval being occasionally as long as four months; when it occurred, the flow was represented by 2 drop or two of blood only, and dysmenorrhœa was severe. At each proper period, if the flow failed to appear, severe molimina occurred in the form of abdominal cramps and headache. Examination showed the uterus to be normal in shape, $4\frac{1}{2}$ centimetres ($1\frac{3}{4}$ ") in length, with a very thin wall; both ovaries were palpable, but smaller than normal.

The commonest form of amenorrhœa at this period of life is, however, the constitutional amenorrhœa associated with chlorosis. In chlorotic subjects we have to do, not with a symptomatic absence of the menstrual discharge, but with a failure of the ovarian function, the graafian follicles failing to ripen. We generally find, according to *Gebhard*, that chlorotic girls begin to menstruate at the usual age, or even earlier. Menstruation recurs once or twice at irregular intervals, and then gives place to complete amenorrhœa, it may be suddenly, it may be gradually, the flow on each occasion being scantier than before. In chlorotic patients, the menstrual discharge, when present, is very thin and watery, and often contains a large admixture of mucus derived from the cervical canal and the cavity of the uterus. The amenorrhœa may be of short duration; or it may last for a long time; so that it is not until after the lapse of months or years, and as a rule in consequence of suitable treatment, that menstruation recurs, being henceforward either normal in frequency and strength, or on the other hand permanently scanty and of the postponing type. The associated disorders from which the patients suffer take the form of headache, dizziness, syncope, feelings of oppression, disinclination for mental and physical exertion, and so on. Since in such cases the ripening of the ovarian follicles also fails to occur, when the amenorrhœa is complete the menstrual molimina are generally wanting (*Gebhard*).

Stephenson also states that in girls who have been chlorotic for a longer or a shorter time, menstruation frequently begins very early, in any case earlier than in healthy girls.

Usually in these cases various other disorders are associated with the amenorrhœa, such as colicky pains in the abdomen, sensitiveness

of the abdominal wall to contact or pressure, headaches, attacks of hemicrania, general mental depression, and hysterical manifestations.

In chlorotic girls, at the times when menstruation is due, a watery discharge often occurs, sometimes slightly tinged with blood. Dysmenorrhœa may also occur at such times.

Attacks of menorrhagia in young girls are usually dependent on disturbances of the nervous system. Sometimes such an attack occurs at the very first menstrual period. Occasionally also menorrhagia may occur in association with chlorosis, to be distinguished according to *Virchow* from a rare condition named by him "menorrhagic chlorosis," characterized by excessive menstruation of an anticipating type. The bleeding is in such cases seldom very profuse, however, but the periods are very long, and the intervals exceedingly short. *Castan* regards such profuse menorrhagia and metrorrhagia occurring in young chlorotic girls, especially at the commencement of puberty, as of an endoïnfecive nature dependent upon auto-intoxication. The toxins lead to inflammatory and degenerative changes in the muscular substance of the uterus. According to *Fränkel* in these cases the ovaries are usually enlarged, seldom smaller than normal.

Frælich has discussed this subject exhaustively in his monograph on *Menorrhagia of Young Girls and Hypertrophy of the Cervix Uteri*.²¹ He states that the cases of menorrhagia in young girls at the time of the menarche may be arranged in two groups. In one of these the patients are chlorotic, and menstruation is normal neither in amount nor in duration, but it is the long continuance of the flow rather than its profuseness that gives rise to danger; in the cases belonging to the other group the patients are in excellent health at the commencement of puberty, but menstruation soon takes the form of long-continued and profuse menorrhagia. Cases of the latter kind are due to hypertrophy of the cervix uteri and fungous metritis. Such attacks of menorrhagia in young girls are seen also in cases of infectious disorders, as in smallpox, measles, scarlatina, and above all, influenza. The hæmorrhage often begins in the first days of the infection, and even during the period of incubation, one or two days before the appearance of the general symptoms. If the patient is attacked by influenza while menstruating, the menstrual flow may assume the character of a true menorrhagia. More often, however, in such cases, we have to do with an extra-menstrual hæmorrhage, such as may indeed be observed in girls who have not yet begun to menstruate.

²¹ *Menorrhage des Jeunes Filles et Hypertrophie du Col Utérin.*

Inflammatory Processes.

Chronic metro-endometritis, both corporal and cervical, occurs occasionally in young girls during the years of development. It is especially common in chlorotic subjects; and next to these in girls who are careless about the observance of hygienic precautionary measures during the menstruation. Thus it may result from physical exertion among the working classes; and from dancing, skating, riding, or mountaineering, among girls belonging to the well-to-do classes, during menstruation. Again, we meet with it in girls who work very hard at the sewing-machine; and, finally, in those who have long practiced masturbation. Through uncleanness at the time of menstruation, the blood with which chemise and drawers are stained and the pubic hair soiled, undergoes decomposition, and this may lead to catarrhal inflammation of the vulva and vagina and of the endometrium. The most striking symptom in persons thus affected is the discharge of mucus, which in cervical metro-endometritis leads to a very moist condition of the external genitals, and leaves greenish-yellow spots on the under-linen; in corporal metro-endometritis the discharge is of a thinner consistence, milky in appearance, and not very abundant. As a result of the endometritis, the patient suffers from various pains in the body, a feeling of fulness, sacache, general sense of fatigue, and diverse nervous manifestations; sometimes also from dysmenorrhœa, strangury, or obstinate constipation. In consequence of the great thickening of the mucous membrane that often occurs, menstruation becomes very profuse and long-continued, lasting from one to two weeks.

A form of chronic vulvitis, sometimes, though indeed quite rarely, met with in girls at this time of life, is inflammation of the external genitals dependent on masturbation. As characteristic signs of this we may observe an elongation of the nymphæ, the clitoris, or the præputium clitoridis, and at the same time on the inner surface of the greatly stretched labiæ we may notice a great increase in the sebaceous glands, so that the yellowish spots formed by these structures may be seen beneath the mucous membrane with the unassisted eye—the mucous surface, indeed, may be slightly uneven in consequence of their enlargement, so that they resemble small retention-cysts. The mucous membrane of the vulva between the margin of the hymen and the nymphæ is moreover, according to *Veit's* description of masturbatory vulvitis, often beset with small pointed excrescences, the soft furrow between the clitoris and the external orifice of the urethra being very commonly marked by swelling of the mucous membrane and the presence of these little outgrowths; but sometimes also the parts lying to either side of the urethral orifice may exhibit similar changes. These small structures differ

entirely from pointed condylomata — they do not branch, they occur only upon the vulval surface proper, not upon the parts exhibiting the characters of true skin, and they are non-infecting. More particularly, it must be remembered, we find these changes principally in virgins in whom on account of obscure symptoms an examination of the genital organs has been undertaken, and who suffer in addition from nervous and hysterical manifestations. The hymen, when intact, as it usually is in these cases, furnishes objective evidence that sexual intercourse is not the cause of the patient's trouble, and indeed a distinctly ascertainable cause is hard to find. The patient usually exhibits abnormal sensitiveness and excessive prudery. *Veit* is of opinion that the association of all these symptoms justifies the diagnosis of masturbation as the exciting cause of the chronic vulvitis; in such cases we may at one time find the mucous membrane pale, but at a later examination fiery red, and we often see a clear, transparent secretion exuding from the ducts of Bartholin's glands.

In consequence of long-continued masturbation, other pathological changes may take place in the female genital organs, such as hypertrophy of the nymphæ, proliferation or glandular hypertrophy of the uterine mucous membrane, ovarian irritation, pains in the ovarian region which, in severe attacks, may radiate to the thighs. These pains become more severe at the menstrual period, especially at the beginning of that period; and are sometimes also especially troublesome in the middle of the intermenstrual interval, in this case usually as a result of great bodily exertion.

These morbid processes in the genital organs of young girls have long attracted the attention of physicians, and it is more than sixty years since *Bennet* described the "virginal metritis" observed by him in twenty-three virgins. *Bonton* published in 1837 a monograph on this condition. *Gallard* assigns masturbation as its principal cause.

Retroflexion of the uterus is also sometimes observed in virgins, induced by the bad habits which are so common in young girls of retaining the urine for excessively long periods and of neglecting constipation. The prolonged distension of the bladder leads to a daily, long-continued stretching of the ligamentous apparatus of the uterus; the full bladder presses the uterus backwards, and after the viscus has been emptied, the flaccid ligaments are no longer able to restore the uterus to its normal position of ante flexion. The organ is left with its fundus directed backwards, and the intra-abdominal pressure keeps it permanently in this position; at the same time, an accumulation of feces in the rectum, by pressing the cervix forward, favors this displacement of the uterus. Moreover, when the uterine tissues are flaccid through malnutrition in

chlorotic or anæmic subjects, the organ yields more readily to mechanical influences than it would if its muscular tone was healthy.

Disorders of Hæmatopoiesis.

Chlorosis is in general rightly regarded as a disease of the period of puberty etiologically dependent on the processes that at this time of life occur in the genital organs. Its appearance generally coincides with the menarche, occurring at the age of 14 to 16, or even later, at the age of 19 to 21. As regards the composition of the blood in chlorosis, investigations have shown that its hæmoglobin-richness is always diminished; its specific gravity is proportionately lessened, but the specific gravity of the serum is normal. The erythrocytes are normal in number, or only slightly diminished; their shape is sometimes normal, sometimes, however, poikilocytosis is present. The leucocytes are generally normal both as regards number and form; myelocytes (*Markzellen*) are also described as present in the blood of chlorotic patients (*Neusser, Hammerschlag, Gilbert, Weil*); the blood-plates are normal in number, the alkalinity of the blood also normal, the isotonicity of the erythrocytes rather low.

The relation of chlorosis to the menarche is variously explained. *Kahane*, in his elaborate monograph on chlorosis, regards it as an independent disease belonging to the group of "disorders of vegetation" (*Kundrat*), one which "according to its essential nature is an expression of the disharmony that obtains between the congenitally inefficient hæmatopoietic apparatus and the demands made upon the feminine organism by the processes of puberty."

An insufficiency of the hæmatopoietic organs as regards their functional capacity is believed by *Kahane* to be in the case of women so far physiological inasmuch as their blood is inferior to that of men in hæmoglobin-richness and corpuscular richness to the extent of about 10 per cent. In this way the predisposition of the female sex to chlorosis may perhaps be explained. A further fact which must be taken into consideration is the difference between the development undergone by the respective sexes at puberty. In the female sex, this development is quickly completed, and has the characteristics of a revolution; but in the male, the development is a more gradual one, and has the characteristics of an evolution.

F. A. Hoffmann also regards chlorosis as associated with the development of the uterus and the establishment of menstruation. It is possible that these processes exercise some reflex influence; but we must also remember that the chemical processes involved in the growth and maturation of the ovarian follicles are still insufficiently understood, and that it is quite possible that these too

may have powerful and unaccustomed effects on the organism such as may well disturb metabolic processes of a somewhat unstable character.

Grawitz, who regards chlorosis as a vasomotor neurosis in which disturbances arise in the interchange of fluids between the tissues and the vessels, refers the appearance of chlorosis at puberty to the general disposition to disorder exhibited at this age by the vasomotor system.

Other authors consider chlorosis to be an ovarian auto-intoxication, believing that under certain conditions the ovaries give off into the organism certain poisons; or, on the other hand, supposing that a certain antitoxic function, normally possessed by the ovary, fails. *Von Noorden*, for instance, regards chlorosis as a disorder of blood formation referable to a disturbance of the internal secretion of the ovary during the developmental period.

Blondel, who also regards ovarian auto-intoxication as causal, is of opinion that chlorosis is induced by products of decomposition formed in the organism during the process of growth. As in childhood the thymus gland, so later in life the ovary, renders these products innocuous. When this peculiar functional activity of the ovary is retarded in its appearance, the intoxication effected by the products of decomposition formed during the process of growth gives rise to chlorosis.

Meinert, in an interesting manner, brings the harmfulness of wearing a corset during the years of development into etiological relations with chlorosis. In the transitional period between childhood and the age of puberty the wearing of the corset usually begins. Now *Meinert* discovered that in chlorosis, as a result of wearing a corset, a vertical or subvertical position of the stomach ensues as a partial manifestation of enteroptosis, leading to tension on the abdominal plexus of the sympathetic, which in turn results in changes in the blood, and other nervous symptoms. According to this view, chlorosis is a peculiar general neurosis dependent upon an artificially induced gastropoptosis; this form of enteroptosis being due, not to relaxation of the suspensory ligaments of the abdominal viscera, but to pressure exercised by adjacent organs in consequence of a change in the form of the thorax, which has been permanently constricted by tight-lacing (*fixierter Schnurthorax*).

Of importance is the fact that in girls suffering from chlorosis a condition of hypoplasia of the genital organs is not infrequently met with. It would seem, not only that imperfect development of the female genital organs may be a cause of chlorotic changes in the blood, as appears possible in view of the relations between the ovaries and the hæmatopoietic organs through the intermediation

of the sympathetic system; but also that genuine chlorosis and the anomalies of the genital organs met with in this disease, may perhaps be common manifestations of some more general disturbance.

According to *Virchow*, two distinct forms of chlorosis are to be recognized, one form in which no great abnormalities of the reproductive apparatus exist, and another form in which imperfections in the development of the central portion of the vascular system are associated with similar imperfections in the reproductive apparatus. In many cases of chlorosis, he found the ovaries small and imperfectly developed, in an infantile condition; in other cases, however, they were three times the normal size; the development of the uterus in such cases usually corresponds with that of the reproductive glands. With regard to the etiological connection between chlorosis and developmental disturbances, *Virchow* inclines to the view, that in chlorosis a predisposition, either congenital or else acquired in early youth, must be assumed to exist, but that this does not manifest itself by the production of actual disorder until the arrival of puberty; and he considers it likely that primary deficiencies of the blood and the vascular apparatus hinder the development of the reproductive apparatus.

Stieda found that in chlorotics displacements of the uterus were common, with abnormal narrowness of the vagina, absence of the pubic hair, imperfect development of the pelvis, and the growth of the breasts interfered with to this extent, that the nipples and areolæ were abnormally small. He classifies these manifestations as disturbances of development in the sense that they are among the so-called stigmata of degeneration. If in chlorotics the breasts in certain cases have a normally full and rounded appearance, this appearance is sometimes deceptive, the fulness being due, not to a proper growth of the parenchymatous mammary tissue, but to an excessive deposit of fat. Genuine chlorosis, therefore, not referable to some other primary disorder, is a developmental disorder, in the sense in which various other stigmata of degeneration met with in the human body are developmental disorders, and is indeed frequently associated with other stigmata of degeneration, or with malformations due to arrest of development, as for instance, an infantile type of pelvis or of genital organs, abnormalities of the cranial bones, vaulted palate, the root of the nose broad and depressed, extreme prognathism.

Hegar also maintains the view that chlorosis is in most cases a developmental disturbance, the origin of which is not limited to the so-called years of puberty; it often arises from noxious influences which are either strictly inherited or began to operate when the infant was still in her mother's womb. *Fränkel* is inclined to

regard a primary developmental disorder of the genital organs as the cause of many cases of chlorosis.

Recently, *Breuer* and *Seiler* have undertaken experiments on bitches, which they spayed at the outset of puberty, and from the results of these experiments it seems probable that a disordered influence exercised by the ovaries on the blood plays a part, at least, in the pathological mechanism by which chlorosis is induced.

The intimate relationship believed to exist between chlorosis and the sexual life of woman finds expression in the opinion, which dates back to the days of antiquity, and has been widely held even by physicians, that the disease (hence designated *morbus virgineus* or *febris amatoria*) is due to sexual abstinence in individuals with powerful sexual impulse, and that for this reason chlorosis is often cured by marriage. This result of marriage, which, though apparent merely, may indeed often be witnessed, is explained by *Kahane* on the ground, that in very many cases, the symptoms of chlorosis become less severe after the first five years have elapsed since the commencement of puberty, the improvement occurring quite independently of the marriage or continued celibacy of the sufferer. The influence of marriage in curing chlorosis is thus apparent merely to this extent, that a very common age for marriage in women is precisely in the twentieth, twenty-first, or twenty-second year, when five years have passed since menstruation began. By this time the organism will to a large extent have become accommodated to the demands made upon it by the processes of puberty. Experience also shows that chlorotic girls sometimes continue to suffer from the various symptoms of chlorosis even after they have become wives, and that chlorosis is not infrequently rendered more severe by the puerperium — but in a wife it is no longer customary to describe such symptoms by the name of chlorosis, they are called anæmia, hysteria, nervousness, etc. Further, in order to give the doctrine of *morbus virgineus* its death-stroke, *Kahane* directs attention to the fact that numerous cases of chlorosis are met with in young girls who are far from practicing sexual abstinence, especially, for instance, amongst the lower classes, amongst whom it is hardly customary to wait for marriage before beginning sexual intercourse. The connection between masturbation and chlorosis, which has also been widely alleged from the etiological standpoint, is moreover one that cannot be admitted. On the other hand it is easy to understand that the erotic reveries which are so often seen in chlorotic girls are very likely to induce the habit of masturbation.

In young girls at the time of the menarche, especially in those who suffer from amenorrhœa or from irregular menstruation, the anæmic form of obesity not infrequently develops. Such patients

at the time of puberty exhibit signs of marked anæmia in association with a notable increase in fat. The skin in such cases is always strikingly pale and of a whitish-yellow color; in bodies which are in other respects beautiful the bust may have the appearance of a marble statue. Such girls are strikingly stout, but the fatty tissue is flaccid, soft, and spongy, and dependent parts readily become œdematous; the muscular system is generally feeble.

What especially characterises this anæmic form of lipomatosis in young girls is, that, even in mild forms of the affection, cardiac symptoms are apt to become prominent. Frequent and violent palpitation will occur even in the absence of any severe exertion or especial excitement, often also we see shortness of breath, precordial pain, anxiety, respiratory distress, and sensations of chilliness and fatigue.

The principal cause of the obesity in these cases is to be found in the anæmia, inasmuch as the diminution in the number of the erythrocytes is a diminution in the number of the oxygen-carriers, and this entails defective and insufficient oxidation. The deficiency in the albuminous constituents of the body also gives rise to a rapid and extensive deposit of fat, the power for the combustion of the fats absorbed from the food being insufficient. An auxiliary factor in producing obesity in such anæmic girls is their disinclination to physical exercise, dependent on the speedy onset of sensations of fatigue. The long-continued repose of the muscles, and the remaining almost continuously in close rooms insufficiently supplied with oxygen, also result in the withdrawal from the blood of the circulating fat and its deposit as adipose tissue.

Albuminuria at the time of the menarche is a disease of development which is not infrequently met with in chlorotic girls, as in adolescent boys. On examination of the urine in such young girls we detect the presence of a variable quantity of albumin, which is present especially after severe physical exertion, mental application, or emotional excitement, whilst the urine secreted at night is usually free from albumin. The skin is pale, the accessible mucous surfaces are comparatively colorless, the face is puffy, the eyelids are œdematous; the patients suffer from various nervous troubles, especially headache and dizziness, and they are also liable to dyspeptic disorders.

The cause of this albuminuria of puberty is according to *von Leube* in part disordered hæmatopoiesis, in part a slight degree of cardiac insufficiency with a tendency to stasis. At the time when the processes of development and the growth of the body in height are most active, there is not a corresponding increase in the energy of hæmatopoiesis, and the heart also fails to keep pace with the growth

of the body and to meet the demands thus made upon it by vigorous growth and increased energy. In general the capacity of the heart in such individuals is indeed sufficient to maintain the circulation through the kidneys; but as soon as the functional activity of the heart is more strongly taxed and the energy of the circulation consequently declines, albuminuria occurs — and occurs all the more readily in consequence of the fact that, the hæmoglobin-richness of the blood having been lowered by the customary anæmia, the epithelium of the renal glomeruli is badly nourished and functionally inadequate.

When the period of the menarche is safely passed, when the menses recur with regularity, and the chlorotic manifestations disappear, when the process of hæmatopoiesis has improved in quality, and the growth of the body is completed — when, in short, the functional equilibrium of all the vital processes becomes re-established, the albuminuria of puberty ceases. It seems, however, that those who have suffered in this way are predisposed to a return of the albuminuria at the climacteric period, when the metabolic balance is once more disturbed.

Cardiac Disorders.

The commonest cardiac disorder at this period of life is nervous palpitation, occurring in young girls who are in other respects in good health, being free from anæmia and from any discoverable disease of the heart or vessels. That this disorder is dependent on the sexual processes is indicated by the fact that it first manifests itself in a stormy manner some time, weeks it may be or months, before the first appearance of menstruation; recurring at irregular intervals, the attacks continue till after the first menstruation, and cease soon after the regular return of the period. Objectively, the palpitation of the heart manifests itself by an increase in the frequency and strength of the cardiac impulse, and increased frequency and tension of the pulse; in a few cases, however, it is perceived subjectively only by the patient, as a distressing sensation of excessively frequent and powerful cardiac action. In the former group of cases, the enhanced activity of the heart is perceptible, not only by auscultation, by which we usually find the heart-sounds quite pure, but also by inspection, which shows us the violent agitation of the thoracic wall and increased pulsation of the carotids. On percussion, no change is found in the area of cardiac dulness. The frequency of the pulse is increased, usually reaching 120 to 140 beats per minute; it is full, and may be intermittent or irregular. In those cases in which the palpitation of the heart is a purely subjective sensation, we find no increase either in the frequency or

in the strength of the pulse, which may indeed be less frequent than normal. With the palpitation is associated a sensation of strong pulsation in the great vessels of the neck, and often there is pain on the left side of the lower part of the chest, with a sensation of shortness of breath, respiratory distress, precordial pain, and a feeling of pressure upon the chest. Respiration is shallow, and abnormally frequent. The attacks of palpitation recur daily in some patients, in others at intervals of several days; they may occur entirely without exciting cause, or with a cause so trifling that it would not in a normal subject have produced any nervous excitement; the duration of the attacks varies from a few minutes to several hours, and they may occur either by day or by night; in the intervals between the attacks the functions of the heart and the arteries are conducted in a normal manner. The pulse-curves I have obtained during the attacks of palpitation, in those cases in which the manifestations were objective as well as subjective, exhibit a high pulse-wave, the upstroke being rapid and steep, the downstroke also sudden and steep, the predicrotic elevation but little marked, the dicrotic elevation often very distinct.

Less frequent than such attacks of palpitation recurring at irregular intervals are paroxysmal attacks of tachycardia, in which the frequency of the heart and pulse is increased to an enormous extent. This disorder manifests itself a little time before the first appearance of menstruation, thenceforward recurring regularly every three or four weeks, accompanying menstruation, or occurring at the proper menstrual period if menstruation is in abeyance; the attacks last several days. This trouble also disappears a few months after the establishment of menstruation.

Associated with these cardiac troubles are, not constantly indeed, but in the majority of cases, disturbances of the digestive organs.

From the heart-troubles already described, another group of cases must be distinguished, which are also observed at the time of the menarche. They occur in girls in whom the first appearance of menstruation is strikingly delayed, not having yet begun at the ages of 18, 19, or 20 years, or in whom considerable irregularities have occurred in connection with the commencement of menstruation. In such girls, in whom menstruation has appeared late and been irregular, or who are perhaps entirely amenorrhœic, cardiac troubles may be so pronounced that the physician may be led to suspect the presence of organic disease of the heart. The most prominent symptom is frequent and violent palpitation, with strong pulsation in the carotids, respiratory distress, and feeling of anxiety, on continued exertion or even on very slight occasion. On percussion, the heart is not found to be enlarged; on auscultation, the heart-

sounds are found to be very loud, often with a systolic murmur in the mitral region, whilst over the lower end of the internal jugular vein, the humming-top murmur (*bruit de diable*) is audible. The pulse is increased in frequency, at times arrhythmical, and easily compressible. The sphygmographic tracing usually shows a subdicrotic or dicrotic character. The upstroke is not high; the downstroke descends low, almost to the lowest level of the curve, before the enlarged dicrotic elevation begins. The skin is always strikingly pale, pale also are the visible mucous surfaces, the hæmoglobin-richness and the corpuscular richness of the blood are considerably diminished, a feeling of fatigue and various other nervous manifestations are constantly present—in short, in all cases we have to do with the well-known chlorotic disposition, sometimes in association with the manifestations of the anæmic form of lipomatosis universalis. In several such cases, skin affections were also present. Some suffered from acne vulgaris of the face with the usual comedones; others perspired profusely from the palms of the hands and the soles of the feet; others exhibited a bluish coloration of the nose and the ears.

There is yet a third form of heart trouble, much rarer indeed than the forms already described, from which young girls sometimes suffer at the time of the menarche. It occurs in girls who just before the first appearance of menstruation have grown very rapidly, “shooting up to a great height.” They are not anæmic, nor do they appear “nervous;” but they are extremely thin, and they have grown enormously in height during the previous year. These individuals also, who in the previous course of their life have been free from heart trouble, now complain of cardiac distress. As in the cases previously described, they complain of severe palpitation, a feeling of fulness in the chest, shortness of breath on exertion, etc.; but the results of the objective examination are very different. The cardiac dulness is increased in area, especially in vertical extent, the apex-beat may be normal in position or displaced outwards, the impulse is always heaving, abnormally powerful and resistant, the heart-sounds, especially those of the left ventricle, are louder than usual, the aortic second sound accentuated, sometimes ringing, the carotids pulsate visibly. The radial pulse, the tension of which is abnormally high, can be compressed by the finger only with difficulty; sometimes it is jerky in character. The sphygmographic tracing shows a rapid and steep upstroke; in the downstroke, the predicrotic elevation is much larger than normal and also nearer the summit of the curve. Thus we see that all the signs of cardiac hypertrophy are present, hypertrophy, that is to say, of the left ventricle.

The cases of this nature that have come under my observation have not been in girls of the working classes, but among the well-to-do. We cannot therefore regard them as due to overstrain of the heart in consequence of excessive bodily exertions, comparable to the cases met with in young recruits after long marches and violent exercise. We must rather assume that the development of the female genital organs has evoked a storm in the cardio-vascular system, more especially that in some way an increased resistance has been offered to the work of the heart, and that thus the hypertrophy has been brought about; though we may suppose that other unfavorable influences have also been in operation. Such an influence, in these cases, is the rapid growth of the body, which makes enhanced demands on the work of the heart; another is furnished by the almost universally worn unhygienic article of clothing, the cuirass-like corset, which offers a rigid hindrance to the rapid growth of the female body, to the development of the breasts, the thorax, and the upper abdominal organs, and which fails to accommodate itself to the changing conditions of growth, so that much extra work is thrown upon the heart. In such young girls we have very frequently found tight stays, which were worn unchanged without regard to the growth of the body in length, and which, by pressure on the epigastric region, elevation of the diaphragm, and limitation of the respiratory movements of the thorax, actually offered such considerable resistances to the driving power of the heart, as ultimately to lead to hypertrophy of the cardiac muscle.

Summing up our observations, we find that at the time of the menarche cardiac disorders occur in young girls which may be arranged in three groups of cases:

1. Nervous palpitation and paroxysmal tachycardia in persons in other respects in good health, the affection appearing shortly before the commencement of menstruation, and disappearing soon after the flow is regularly established.
2. Cardiac disorders occurring in young girls suffering from chlorosis, which itself results from the processes of the menarche.
3. Cardiac hypertrophy developing at the time of the menarche, and dependent on the circulatory disturbances associated with that process, its appearance being favored also by rapid growth of the girl and by unsuitable clothing (tight lacing).

With respect to the activity of the heart and the circulation of the blood at the time of the menarche, the little-known observations made by Beneke, on the growth of the heart and arteries in the various stages of development, deserve especial attention. According to this writer, the growth of the heart is slow until the age of fifteen years is attained, but becomes accelerated at the commence-

ment of puberty. During this time of puberty, the blood-pressure attains its highest level, being comparatively low in childhood and later in life. The development at puberty of the female heart is less extensive than that of the male heart, and for this reason throughout adult life the capacity of a woman's heart is on the average 25 to 30 cubic centimeters (1.5 to 1.8 cubic inches) less than that of a man. In women, also, the great arteries are on the average somewhat smaller than in men. The various arteries do not develop with equal rapidity throughout the period of growth; after puberty the common carotid grows very much more slowly than the common iliac artery, the former vessel being the only large trunk which has already nearly reached its maximum size at puberty.

The comparatively great development which the heart undergoes at the time of puberty is a phenomenon so important alike in its physiological and its pathological relations that it deserves the special designation of the *puberal development of the heart*; the commencement and the completion of puberty appear beyond question to be to a large extent dependent upon this development of the heart and upon the simultaneous rise in the blood-pressure of the systemic circulation due to the comparative diminution in the calibre of the arteries.

In the literature of this subject of cardiac disorders during the menarche, we find only short annotations on palpitation of the heart in young adolescent girls, and on cardiac manifestations in chlorotic subjects. Further, the statistical fact that valvular lesions of the heart are commoner in women than in men is by many authors explained on the ground that the disturbances of the time of puberty, which certainly occur more frequently and are more severe in the female sex than in the male, play an important part in their causation. Changes also in the vessel, such as cirroid aneurysm (*angioma arteriale racemosum*), are supposed to be connected with the sexual processes of this period of life. C. Heine maintains that in consequence of puberty and of the sexual functions that become established at this period, a teleangiectasis will not infrequently undergo transformation into a cirroid aneurysm; especially in cases in which menstruation is scanty and irregular, angiectatic tumors may exhibit a vicarious periodic increase.

Krieger describes nervous palpitation and also "cramps of the heart"²² as occurring in girls who have not yet begun to menstruate, in the form of prodromal manifestations; similar attacks may occur also at every menstrual period in girls in whom menstruation is

²² The German word used is *Herzkrampf*; in the first line of the paragraph it is used in the plural, and in inverted commas. Angina pectoris proper, the severe and often fatal disease met with chiefly in elderly men, is some-

fully established. In most of these cases the pulse is increased in the patients complain of a sensation of anxiety, and speak of feeling the heart roll, tremble, or flutter, to which is sometimes superadded a sensation of sudden cessation in its activity. Not infrequently there is a blowing adventitious sound, masking or accompanying the heart-sounds; there are also venous murmurs, especially when the heart-trouble is associated with anæmia or chlorosis. Of the cases of pseudo-angina pectoris²² observed by *Krieger*, the attacks occurred as prodromal manifestations before the first appearance of menstruation in 22 per cent. of the cases, after menstruation was fully established in 78 per cent. of the cases; as regards the relation of the attacks, in cases of the latter group, to the menstrual period, they occurred before the flow in 33 per cent., during the flow in 67 per cent.; menstruation was irregular in 10 per cent. of the cases under observation, in most of the other cases menstruation had been irregular, but was now regular.

Hennig records a case in which he observed as a prodromal symptom before the establishment of menstruation the regular recurrence of congestion of the pelvic organs associated with cardiac disorder.

Diseases of the Nervous System.

The extensive transformatory processes occurring in the genital organs of young girls at the time of the menarche, and the powerful impression which the new thoughts, hopes, and fears excited at this period of life cannot fail to exercise on the nervous and emotional life, will enable us to understand how it is that the appearance of the first menstruation may give rise, especially in neurasthenic or psychopathic subjects, to manifold nervous disturbances and also to disorders of the mind.

Amongst the severe neuroses and psychoses liable to occur at the menarche in those suffering from congenital nervous weakness, in those the conditions of whose life are very unfavorable, and in those affected by some sudden disagreeable and powerful influences, we may enumerate: Hemicrania, precordial pain, hysteria, and epilepsy; impulsive manifestations, such as bulimia, longings for various unsuitable things, kleptomania, and pyromania; severe feelings of anxiety; various forms of psychoses.

On the other hand, the first appearance of menstruation has sometimes a favorable influence in girls suffering from nervous or mental disorder. This is seen, for example, in cases of chorea in

times known in Germany as *Herzkrampf*, but the established and distinctive German name for the affection is *Stenokardia*. It is evident, however, that *Krieger's* cases are not cases of true angina, and it is probable that they would be classed by English physicians under the heading of *pseudo-angina pectoris*.
— TR.

fully developed, rapidly growing girls who have not yet begun to menstruate; in such subjects the chorea sometimes disappears as soon as menstruation is regularly established.

Quite frequently, the first appearance of hemicrania in young girls coincides with the menarche. According to *Warner*, hemicrania made its first appearance:

In 1 girl of 3 to 4 years.	In 4 girls of 10 to 11 years.
In 2 girls of 5 to 6 years.	In 2 girls of 11 to 12 years.
In 1 girl of 6 to 7 years.	In 4 girls of 12 to 13 years.
In 5 girls of 8 to 9 years.	In 15 girls of 13 to 15 years.
In 5 girls of 9 to 10 years.	

Toothache, according to *Holländer*, in the early days of puberty sometimes exhibits the twenty-eight-day type of menstruation. The same periodicity has been recorded in cases of vicarious bleeding from the gums in girls suffering from disturbance of the menstrual function.

In the period of the menarche and before this period, chorea minor occurs, as a functional disturbance of the motor region of the nervous system, and especially in girls it is associated with the processes of the period of physical development. The statistical data supplied by a number of authors, *Hughes*, *Pyc-Smith*, *Russ*, *Séc*, and *Steiner*, show that the proportion of boys to girls affected with chorea minor is 1 to 2.8, and that of all ages 49 per cent. of the cases occurred at the ages of 6 to 11 years, 29.8 per cent. at the ages of 11 to 13 years. In several cases, in quite young girls suffering from chorea, pathological changes were found in the genital organs. Thus, in 24 out of 27 girls from the age of 9 to 15 years affected with chorea, *Marie* found the symptom-complex designated by *Charcot* as *ovaric*. Ovarian tenderness was manifested on palpation, and always on that side on which the chorea had first manifested itself. *Leonard* found in a girl aged eleven suffering from chorea, adhesion of the præputium clitoridis; after the separation of the prepuce, the chorea disappeared.

As in respect of various nervous affections, so also in respect of various mental abnormalities, we witness at the time of the menarche numerous manifestations confirming the statement that, "no spinal reflex has such widely-opened and easily accessible paths of conduction toward the organ of mind, as the sexual reflex." "The menstrual process," continues *Friedmann*, "is the only bodily process in relation to which the organ of mind somewhat readily loses the remarkable stability of its equilibrium."

In the experience of all alienists, it is, speaking generally, the inherited psychopathic tendency that especially manifests itself at the time of puberty; and it appears that this predisposition, the manifestations of which the resisting powers of childhood have

hitherto been competent to suppress, undergoes a sudden and stormy development in consequence of the action of the menstrual stimulus, leading to the unexpected appearance of mental disorders. The commonest of these are mania and melancholia of the ordinary type, the prognosis in first attacks being favorable; next in frequency to these are the psychoses characterized by fixed ideas, which usually terminate favorably after a short time; finally, we meet with the moral psychoses of puberty, and the form of melancholia distinguished by Kahlbaum as *Hebephrenie*,²³ the prognosis of which is very unfavorable, for it speedily terminates in dementia, similarly to the dementia of puberty described by Svetlin, dependent upon or associated with premature synostosis of the cranial bones. Very often we witness at puberty the beginning of the periodic varieties of mental disorder, which develop into periodic menstrual psychoses, manifesting themselves regularly at the recurrence of every menstrual period.

The fact that hysteria often first manifests itself at the time of the first appearance of menstruation was noticed already by *Hippocrates*, who indeed believed that the association was sufficiently explained by the well-known manifold relations between this nervous disease and disturbances in the female genital organs. The first hysterical attack often coincides with the first menstruation; or the first menstruation may lead to the recrudescence of hysteria which had manifested itself previously, but had passed into abeyance. We have to deal chiefly with the minor forms, such as uncontrollable and unconditioned attacks of laughing and crying, globus hystericus, clavus hystericus, etc.; hysteria major, on the other hand, is very seldom observed at the time of the menarche. As regards the frequency of hysteria at the time of puberty, we append certain statistical data.

Landouzy found:

4 cases of hysteria occurring at the ages of.....	1 to 10 years.
45 cases of hysteria occurring at the ages of.....	10 to 15 years.
105 cases of hysteria occurring at the ages of.....	15 to 20 years.
80 cases of hysteria occurring at the ages of.....	20 to 25 years.

After the age of twenty-five is attained, the frequency of hysteria declines very rapidly.

According to *Bernutz*, all the statistical data prove that hysteria in more than half the cases first manifests itself either just before or simultaneously with the commencement of menstruation. It seems also that at the time of puberty amenorrhœic and dysmenorr-

²³ *Hebephrenie*.— There is no current English equivalent of this word, used by Kahlbaum to denote a form of melancholia occurring at puberty, and terminating in dementia.— TR.

hæic manifestations may give rise to the development of hysteria. In girls at this time of life, hysteria seldom takes the form of the great hysterico-epileptic crisis, manifesting itself rather as nervous and moody states of mind, moral changes, weakness of will, in association with various forms of anæsthesia, spasm, and paralysis.

On the threshold of puberty the girl with a hereditarily neuropathic disposition may exhibit a tendency to epilepsy. In such cases, as *Kowalewski* writes, the patient has sudden attacks of loss of consciousness, commonly ushered in by a wild scream; during the attacks, tonic and clonic muscular spasms occur, the patient is completely insensible, the pupils are dilated and do not react to light, the pulse-frequency is increased — in short, the typical phenomena of an epileptic fit are exhibited. The loss of consciousness lasts from two to three minutes; and when the girl recovers, she remembers nothing of what has occurred during the fit. Though consciousness has returned, the mind is still at first somewhat disordered; but this disorder soon passes off, the girl becomes calm, and forgets what has happened. The physician is summoned, but in ninety-nine cases out of a hundred, he assures the relatives that “the attack is nothing of any consequence — a simple fainting-fit, the result of menstruation — a transient trouble merely.” A second “fainting-fit” disturbs the calm of the parents, but the reiterated authoritative assurance of the physician that “the trouble will soon pass away” restores their confidence; and they gradually become accustomed to the “fainting-fits” from which their daughter suffers at each successive menstrual period. The daughter marries, and gives birth to neuropathic and psychopathic children, and every one wonders what can be the cause of this misfortune. Hence it is necessary to pay careful attention to these “fainting-fits during menstruation.” In the great majority of cases they are in fact epileptic seizures, and as such they must be treated. *Binswanger* points out that in such cases, in which epilepsy first appears at the commencement of menstruation, the attacks may continue to accompany menstruation for several years thenceforward. Already established epilepsy is said by some authors, *Lawson Tait*, *Tissot*, and *Marotte*, for instance, to undergo at puberty in young girls an increase both in the severity and in the frequency of the attack; *Esquirol*, on the contrary, attributes to puberty a favorable influence on the course of epilepsy, a view held already by *Hippocrates*.

Not infrequently, attacks of precordial pain associated with tachycardia occur during the first menstruation. These attacks are usually of short duration.

Acromegaly, a disease regarded as a trophoneurosis, also requires mention here, this disturbance of growth being considered by several

authors, and especially by *W. Freund*, to be in some way connected with the development of puberty; the tendency to acromegaly, it is suggested, is produced by the remarkable transmigration that occurs at puberty of the energy of growth from its accustomed paths into new channels. The relations which *Neusser* has shown to exist between the ovaries on the one hand and the vegetative nervous system and the process of hæmatopoiesis on the other, give a certain amount of support to this hypothesis, even though we have no intimate knowledge of disturbances occurring in the reproductive system during the period of development, which might have an influence in the causation of acromegaly.

Of old and of recent observations on the psychoses connected with the menarche, there is no lack. From the time of *Hippocrates* down to the present day, the authorities have continued to report cases in which the commencement of menstruation proved the exciting cause of the appearance of psychoses. *Rousseau* writes of a girl at the time of the menarche, who before the first appearance of menstruation suffered from attacks of melancholia and a tendency to pyromania, and under the influence of the latter tendency she twice committed acts of incendiarism.

According to *Kirn*, the psychoses that manifest themselves in the first period of the commencement of menstruation, sometimes melancholia, sometimes amentia in the form of slight and transitory maniacal derangement, more rarely a katatonic²⁴ condition, may precede the menarche, or may accompany or follow it.

A special form of psychosis is associated with the menarche (*von Krafft-Ebing, Griesinger, Friedmann, Schönthal*). The influence exercised by puberty in this direction manifests itself in various ways, and is the more powerful for the reason that several factors are in operation, each of which exercises an individual influence upon the type of the psychical affection; these factors are, childhood, the development of puberty, and the periodicity of the disturbance exercised by the menstrual reflex. The last named of these influences is the most potent. It manifests itself in the following manner: Certain psychoses which develop before the commencement of menstruation or during the suppression of the flow, undergo modification when menstruation appears; further, in the typical menstrual psychoses of psychopathically predisposed girls, the attacks recur either at the beginning of each period, or, when the flow is in abeyance, at the dates when it should appear — the menstrual stimulus thus being the exciting cause of the successive attacks in an organ of mind whose resisting powers are deficient; and, finally

²⁴ Katatonia (*Katatonie*) is a term used in Germany to denote insanity associated with muscular rigidity.—Tr.

a disturbance in the development of menstruation may be, not merely the exciting cause, but the efficient cause of the psychosis.

In cases of the last kind, which have been observed by *Schönthal* and also by *Friedmann*, who has described them very fully under the name of primordial menstrual psychosis, we have to do with young girls in whom the appearance of menstruation is retarded, or in whom the flow has been suppressed very soon after its commencement. The girls were as a rule hereditarily well endowed, and the psychosis thus appeared without warning, like a storm from a clear sky. Exactly periodical in form and character, the period of recurrence being three or four weeks, this psychosis clearly showed its dependence upon menstruation; the individual attacks usually lasted a few days only, and were characterized by distinct mental disorder, in the form either of maniacal restlessness, or of dominant depression; vasomotor disturbances were very prominent, with disordered pulse, as for instance, a rapid rise in the pulse-wave just before the onset of the attack, succeeded during the attack by a correspondingly rapid decline.

Friedmann enumerates a number of the peculiarities that characterize these attacks. The general course of the malady is an exceptionally stormy one. The ultimate cure may coincide with the definite regularization of menstruation; or, in cases in which menstruation is restored but remains inadequate, the course of the disorder may become a gentle undulatory one, the violent stimulus of total suppression being replaced by a more moderate stimulus — here also, however, a cure ultimately follows when menstruation at length becomes free as well as regular. But during the height of the malady a proper development of menstruation is always wanting. The total duration of the malady may vary from as little as two to as long as nine months, or even longer. The cure is, however, ultimately a complete one. The combination of a disturbed and delayed development of menstruation with a stormy periodic cycle of attacks of mental disorder, and the ultimately favorable termination, constitute according to *Friedmann* the peculiar characteristics of this form of puberal psychosis.

Masturbation.

Masturbation is sometimes practised in very early childhood, being then commonly due to local irritation of some kind, as for instance when threadworms find their way into the vagina. Itching results, leading the child to rub the genital organs. This rubbing produces a pleasurable sensation, and gives rise to repeated masturbation. But in adolescent girls at the time of the menarche, a vague impulse arises to handle the genital organs, depending upon cerebral

processes which are themselves the result of sexual sentiments, of reading, or of conversations with sexual instructed female friends. This vague impulse may lead to masturbation, and will do so earlier and more surely if the girl is a neuropsychopath by inheritance. The local influence of menstrual congestion, however, also plays a part in provoking the impulse toward masturbation, since at every period a hyperæsthetic state recurs in the genital organs.

Girls thus addicted have sometimes a very striking general appearance. They are pale, with a weary expression of countenance, their eyes are dull-looking and darkly ringed, their movements are sluggish, they like to spend a long time in bed—signs, however, which I by no means wish to adduce as characteristic of onanists.

Temperament and mode of life are decisive in determining the greater or less frequency of the habit of masturbation in young girls. Girls of a passionate temperament, those also who from early childhood have been accustomed to mix much with young persons of the opposite sex, and those, finally, in whom from conversation on the subject with female friends or from the perusal of erotic literature, sexual enlightenment has occurred at an early age, experience the awakening of the sexual impulse earlier and with greater force, than phlegmatic girls, than those who have grown up apart from boys, and than those who have been strictly and carefully brought up. Masturbation may arise either instinctively or from instruction.

In young girls masturbation is usually effected by friction of the clitoris; less often by intra-vaginal manipulation, since this is liable to lead to injury to the hymen. For the former purpose the finger may be used; or some other article, such as a knot tied in the nightgown, or a rounded projection on some article of furniture; in one case the friction was effected by the naked heel. If two female onanists come together, they practice tribadism, presently to be described. Opportunity for this practice occurs especially in institutions in which young girls occupy a common dormitory, and sleep together without adult supervision.

An experienced physician, *Gutzeit*, is of opinion that in young girls of 10 to 16 years of age masturbation is on the whole less common than in boys of the same age, but that on the other hand from the ages of 18, 19, and 20 onward, "sexual self-gratification is almost universally practiced by women, even if it be not always practiced to excess," an opinion which cannot, however, be regarded as conclusive. As consequences of masturbation in the female sex, this author has observed: Fluor albus, menorrhagia, enlargement and prolapse of the uterus, pains in one or other ovary, hysterical paroxysms, great pallor.

L. Löwenfeld remarks that the manifestations of the sexual impulse are not normally present in the days of childhood. In consequence of pathological conditions, especially of such as effect the genital organs, in consequence of chance impressions, or in consequence of a bad example, sexual passion may indeed be awakened in children in its fullest intensity. Normally, however, the distinct manifestation of the sexual impulse is associated with a certain degree of development, of ripeness, of the reproductive organs. Physiologically, sexual passion is entirely wanting in young girls before the age of puberty.

As regards the act of sexual self-gratification, this author distinguishes two forms of masturbation: (a) Peripheral-mechanical; (b) mental (psychical onanism). In the former class of cases, the sexual orgasm is produced solely or chiefly by mechanical stimulation of the skin or mucous membrane of the genital organs. In the female sex, in addition to manual stimulation, an extraordinary variety of hard and soft articles are introduced into the vagina for this purpose. Many females effect sexual self-gratification by rubbing and pressing movements of the thighs one against the other, in which the clitoris is implicated. In psychical onanism, on the contrary, as *Löwenfeld* points out, the orgasm is produced solely by central stimulatory representations, without the assistance of any manipulation of the genital organs. The ideas that have this effect are for the most part lascivious trains of thought or the recollection of previous sexual experiences, on which the attention is concentrated. If we wish to estimate the harmfulness of the different forms of masturbation as regards the mind and the nervous system, psychical onanism must incontestably be regarded as the most deleterious.

In the female sex onanism is, in *Löwenfeld's* opinion, less widely practiced than in the male; none the less, it is in the former sex far commoner than is generally believed, a fact on which *Eulenburg* likewise insists. Frequently, also, in females, a congenital neuropathic tendency plays a part in the causation of masturbation, in so far as this tendency takes the form of premature sexual excitement or of excessive intensity of the sexual impulse. In the absence of this tendency, masturbation rarely leads to the production of well-marked nervous disturbances, and does so only when practiced to very great excess. *Beard* reports that in the powerful and full-blooded working-class girls of the Irish race, masturbation, even when practiced for many years, did not result in any notable disorder to health.

As regards the nature of the nervous manifestations met with in women as a result of masturbation, there develops, according to

Löwenfeld, in one group of the cases, the sexual form of myelasthenia, characterized principally by sacache and lumbago, hyperæsthesia and paræsthesia in the domain of the genital organs (ovarie,²⁵ pruritus vulvæ et vaginæ, etc.), irritable bladder, coccygodynia, weakness and paræsthesia of the legs (feelings of fatigue and chilliness), finally, the onset of erotic dreams. In many cases, in the course of time, to these symptoms are superadded the manifestations of cerebral and visceral neurasthenia (headache, insomnia, nervous dyspepsia, palpitation), so that the clinical picture comes to be one of general neurasthenia. In addition to the neurasthenic troubles, manifold hysterical manifestations may occur.

Disorders of Digestion.

Disorders of the digestive apparatus are quite common in girls during the period of puberty, and usually take the form of nervous dyspepsia. Disturbances of sensibility predominate, with a sensation of pressure after meals, sometimes increasing to nausea, retching, and vomiting, as manifestations of general hyperæsthesia of the gastric mucous membrane, loss of appetite, a pasty or acid disagreeable taste, sometimes bulimia, perverse sensations of taste, and pyrosis. Especially in chlorotic girls, periodic attacks of pain occur, localized in the epigastrium and its neighbourhood, and exhibiting no relation to the ingestion of food. The free hydrochloric acid varies in amount, being now normal, now diminished, sometimes also increased. In chlorotic cases, the symptoms of round ulcer of the stomach are sometimes observed. Intestinal activity is usually depressed, peristalsis is diminished, so that more or less obstinate constipation is one of the most frequent symptoms.

Hypertrophy of the tonsils at the time of puberty is in some way related to the menstrual processes, whether by the intermediation of the nervous system or by that of the blood. *Eisenhart* quotes observations made by *Chassaignac*, of girls eighteen or nineteen years of age with hypertrophy of the tonsils, associated with retarded puberty, menstruation having begun late and being scanty, and the breasts being underdeveloped; in one young girl with tonsillar hypertrophy, one of the breasts had failed to develop properly, but after the removal of the tonsils it speedily grew to the normal size.

*Diseases of the Respiratory Organs.*²⁶

Not uncommonly at this period of life the growth of a goitre is observed. The influence of puberty on the growth of the thyroid

²⁵ A term introduced by Charcot. See page 97.

²⁶ The author's classification is adhered to. It is not usual, I believe, in Germany, to class the thyroid body among the organs of respiration. But the only disease mentioned under the above heading is goitre. — Tr.

body has indeed been asserted by several authors; and *Neudörfer* maintains that precisely during the period of puberty to this body must be assigned an important regulatory trophic significance for the nourishment and growth of the reproductive organs. *Steinberger* and *Sloan* record the observation of cases occurring in young girls in whom, menstruation having first been regular, but having been suddenly suppressed in consequence of external noxious influences a rapidly growing goitre suddenly appeared.

P. Müller states that in many regions, as for instance in Canton Berne in Switzerland, where the school children exhibit with extraordinary frequency a hereditary tendency to the formation of goitre, during the years of childhood these growths are much less frequent in girls than in boys. At the time of puberty, however, this relation is entirely changed. Whereas in boys from this time onward no further growth of the thyroid body is observed, in girls at puberty the hypertrophy greatly increases, so that very large goitres are formed. The same author recurs to the earlier observations of *Heidenreich* and *Schönlein*, as well as to those of *Friedreich*, by which this influence of puberty is strikingly manifested, and he believes it to be established by experience that sexual excitement can produce a transient swelling of the thyroid body. He alludes also to the remarkable fact that a swelling of the thyroid body, to which a number of animals show a tendency, occurs chiefly at the time of heat or rut; this is especially well known to occur in the case of stags. Similarly, during menstruation, a transient swelling of the thyroid body can sometimes be detected; the swelling is greater if the menstrual discharge fails to occur.

Diseases of the Organs of the Senses.

At the time of the menarche in cases in which there is retardation or some other disturbance in the regular appearance of menstruation, affections of the eye are observed, which are in part functional, dependent on reflex influences proceeding directly from the genital organs without organic changes, and in part are due to circulatory disturbances. *Mooren*, *S. Cohn*, and *Power* have discussed the relations between the uterus and the eyes in general, and also in this especial connection. Of ocular troubles during the menarche, iridochoroiditis, hæmorrhages into the vitreous body, long-continued blindness, and pannous keratitis, are mentioned, which may either disappear with the reëstablishment of menstruation (spontaneous or artificially effected), or may exhibit in such circumstances a notable alleviation. Chronic inflammatory states of the conjunctiva, usually of an eczematous nature, which frequently occur at the time of puberty, often exhibit a relation to the menstrual process, a monthly exacerbation of the ocular trouble

coinciding with disordered menstruation, and cure taking place only when menstruation has become perfectly regular. Vicarious hæmorrhages into the vitreous body also occur, associated with disturbances of menstruation, the relapses ceasing as soon as menstruation becomes regular; such a case was observed by *Courserants* in a girl of fourteen years.

Disturbances of hearing have been observed at the time of puberty in young girls addicted to masturbation; the patients complain of subjective noises, rising in intensity till actual hallucinations may be experienced. *Lichtenberg* reports the case of a strong girl eighteen years of age, in whom the congestion associated with puberty was followed by atrophy of the auditory nerve. The same author, also *Ashwell*, *Law*, *Puech*, *Rossi*, *Stepanow*, and *Gilles de la Tourette*, have published cases of vicarious menstrual hæmorrhage from the external auditory meatus, occurring in girls of ages varying from 14 to 16, 17, 20, and 22 years. Amongst these cases, in some the auditory organ was in a healthy condition, but in others there was associated purulent discharge; the bleeding took place from the ears at the menstrual periods, the proper menstrual discharge being absent or scanty; after the ear trouble was cured, menstruation was normal. Of 200 cases of vicarious menstruation, there were, according to *Puech*, six in which the vicarious bleeding was from the ears.

Disturbances of the olfactory sense, taking the form, sometimes of diminished acuteness of this sense, sometimes of increased acuteness, and sometimes of perversion, also anomalies in the secretion of the nasal mucous membrane, either abnormal dryness, or greatly increased secretion of mucus, come under observation at this period of life, either as reflex manifestations through the intermediation of vasomotor nerves at the time of the first appearance of menstruation, or in consequence of chronic nasal catarrh, which may be connected with masturbation. In cases in which the menarche is retarded, vicarious epistaxis may also occur, the bleeding sometimes being very profuse, in one case, indeed, reported by *Fricke*, in a girl seventeen years of age, having a fatal termination. According to *Mackenzie*, sexual excitement leads to swelling of the nasal mucous membrane, and habitual masturbation to chronic nasal catarrh; the same author asserts that during menstruation, swelling of the turbinate bodies may always be observed, and that in this lies the explanation of the fact that many women complain of a monthly cold in the head as an accompaniment of menstruation.

Diseases of the skin are not uncommon in young girls at the time of the menarche, and later as an accompaniment of each successive menstruation. It is a well-known fact that at puberty girls sometimes lose a hitherto beautiful complexion, and suffer from various

disfigurements of the skin of the face. These are produced especially by the profuse secretion of sweat, and by the excessive secretion of the sebaceous glands, which so often results in acne, an inflammation of these glands. Ecchymoses also, effusions of blood into the skin, are observed, especially, as a form of vicarious menstruation, in cases in which menstruation is irregular. When actual bleeding occurs from the intact skin, the blood finds its way out through the sudoriferous ducts—*hæmatidrosis* occurs; in some cases, however, the hæmorrhage takes place from areas of skin altered and injured by disease, from wounds or other injuries, from ulcers, or from excrescences. Hæmorrhage into the skin occurs also in the so-called stigmatization, in which condition also an etiological rôle has been assigned to menstruation.

In the skin, remark *Spietschka* and *Grünfeld*, a new life begins at the time of the development of puberty, and it is this which first gives to human beings the external characteristics of sexual maturity. In certain regions which have hitherto been covered only by fine downy hairs,²⁷ thick, strong hairs develop, and at the same time the general growth of hair becomes more active. These regions are, the genital region, and the axillæ. This increased growth of hair is accompanied by a stronger secretion of the sebaceous glands, which very often is in excess of actual requirements, and may thus lead to cosmetic disturbances and to various diseases of the skin. Thus arise the various forms of *seborrhœa*.²⁸ The commonest of these is the formation of comedones, which, at the time of puberty, may make their appearance especially on the nose, the forehead, and below the corners of the mouth, but also on other parts of the face or on the back and the breast; in those regions, that is to say, in which the sebaceous glands attain a considerable size. The retention of the sebum may give rise to inflammation, which the access of micro-organisms converts into suppuration. Thus arises *acne vulgaris*. In another form of *seborrhœa*,²⁸ the secretion is more fluid in consistence, and collects on the surface of the skin, furnishing this with an oily covering—*seborrhœa oleosa*.²⁸ This most

²⁷ In Germany the term *Lanugo*, or *Wollhaar*, is used to denote the rudimentary hairy covering of the body throughout life, as distinguished from the specialized and fully developed hairs of the head, beard, axillæ, etc. In England the use of the term *lanugo* is usually restricted to denote the downy crop of hair with which an infant is covered at birth, which is shed in a few months thereafter. See the English edition of Toldt's *Atlas of Human Anatomy*, Part VI., Appendix, note 503.—Tr.

²⁸ It will be noticed that the author uses the term *seborrhœa* as a general term for diseases of the sebaceous glands, including acne. In England acne, and its preliminary stage, the formation of comedones, are separately considered, the signification of the term *seborrhœa* being limited to denote cases in which the secretion of the glands forms an oily, waxy, or scaly accumulation on the surface. *Seborrhœa oleosa* is defined by Crocker as that form of the affection in which the olein is in excess.—Tr.

commonly occurs on the face; if the fatty layer is removed, the skin remains dry for a brief period only, and soon becomes greasy and shiny once more. Dust readily adheres to the greasy surface, and this gives the face a dirty appearance. Seborrhœa faciei is readily converted into eczema.

With the puberal development of the external genital organs is associated an increase in the sebaceous secretion of these regions. On the clitoris and its prepuce, and on the folds and in the furrows of the vulva, in consequence of insufficient cleanliness, an accumulation of sebum and cast-off epidermic scales readily occurs; such an accumulation may become rancid, may irritate the skin, and may thus give rise to erosions and to purulent secretion.

In chlorotic girls at the time of puberty, on account of the anæmic condition of the blood, eczema is not uncommon, especially on the hands and the face. On the face, or on the forehead, red papules appear on circumscribed areas, and become vesicular; raw, weeping spots are thus formed, and have a very disfiguring appearance. Such eczema may occur also in connection with disturbances of menstruation, when the menses are scanty and pale, or when dysmenorrhœa is present.

At the time when menstruation ought to appear, but fails to do so, sometimes also, when menstruation is regular, with each successive period, an eruption of urticaria takes place; it usually disappears quickly, but in some cases is more persistent; owing to the intense itching it is always an extremely distressing complaint. Sometimes it takes the form of urticaria factitia, in which the skin reacts to every kind of mechanical stimulation, such as rubbing, scratching, or pressure, all of which alike lead to the formation of weals, which may be diffused all over the body. Less often in association with disturbances of menstruation, acute œdema or erythema are observed.

Finally, we must mention herpes progenitalis, a rather uncommon acute condition in which, with violent itching and burning sensation, intense redness and œdematous swelling of the skin, vesicles form on the præputium clitoridis, the nymphæ, and the inner surface of the labia majora.

Hygiene During the Menarche.

It is the object of rational hygiene to increase the resisting power of the organism, which has been depressed by the processes of the menarche, in order that the increased demands made by the awakened sexual life may be adequately met.

The principal means for this purpose are, suitable diet, a suitable mode of life, and the employment of physical therapeutic measures,

among which strengthening and hardening measures are to be preferred.

The diet should be at once as richly albuminous as possible and readily digestible, there should be several, four or five, meals every day; in chlorotic patients food should be taken at regular intervals of two to three hours. Meat should be a predominant article in the diet, but fresh vegetables should also be eaten in abundance for the sake of the nutritive salts they contain; the vegetables rich in compounds of iron, such as spinach, oats, beans, and lentils, are to be recommended; fruit, raw or cooked, should also be taken in considerable quantities. The evening meal²⁹ should not be too succulent or too plentiful; it may best consist of soft-boiled eggs, an omelette, or milk. Alcoholic beverages should be avoided or taken in minimal quantities; only as a stomachic may a glass of beer or of light wine be recommended.

Chlorotic patients should even at their first breakfast²⁹ have a meal rich in albumin, such as a considerable helping of meat, or a beefsteak, with rolls, butter, and tea or coffee. Milk should be taken in small quantities only, not more than a pint to a pint and a half daily; only when solid food cannot be tolerated should milk be given freely. Beer and wine are often of value in chlorotic girls from their stimulant action on digestion and circulation. Half an hour's rest before and after meals is useful.

For the bill of fare of these patients I recommend especially: Roast beef and veal, underdone beefsteak à l'Anglaise, ham; roasted venison, hare, partridge, grouse, fieldfare, hazel-hen, ptarmigan, pheasant, chicken, pigeon, turkey, oysters; asparagus, cauliflower, and spinach. For variety, fish or shellfish may occasionally be taken. Sweetbread in soup or with sauce forms a very delicious and easily digestible dish.

Kahane recommends for chlorotic patients the systematic use of Bavarian beer, to the amount of about two pints daily; it should, he says, be a beer rather dark in tint, full-brewed, rich in malt, but containing a comparatively small proportion of hops, alcohol, and carbonic acid. *Jaworski* has recommended a dietetic iron-beer, containing 4.7 per cent. of alcohol and from 0.0317 to 0.0644 per cent. of iron.

When girls are at the same time anæmic and very thin, fat-containing foods must be taken in abundance, such as milk, butter, and

²⁹ It must be remembered that these dietetic directions are for German and Austrian middle-class people, the arrangement of whose meals differs from ours considerably. The usual meals and hours are: Early breakfast, coffee and rolls, at 8 or earlier; second breakfast, a more substantial meal, at 10; mid-day dinner, the principal meal, at 1 or 2 P. M.; afternoon coffee, at 4; supper at 8 P. M.—T.R.

cream; also large quantities of carbohydrates. Farinaceous foods, rice, potatoes, arrowroot, sago, tapioca, oatmeal, barley meal, carrots, turnips, sweet fruits, grapes, dates, pippins, plums, pears, and preserved fruits—all these must appear at table more frequently than usual; beverages, in addition to milk, that are suitable are chocolate and cocoa, Bavarian beer, and sweet, heavy wines.

The diet-table of such thin chlorotic patients should be as follows:

First breakfast, 7.30 to 8 A. M.: Coffee or cocoa with milk, or a pint of milk, white bread and butter, honey. Second breakfast, 10 A. M.: Half a pint to a pint of milk, egg and bread and butter, or sandwiches of sausage, ham, or roast meat. Mid-day dinner, 1 A. M.: Soup, roast meat with vegetables and potatoes, or fish may take the place of the soup, sweets to follow. Afternoon, 4 P. M.: Coffee with milk, or a pint of milk, with bread and butter. Supper, 7.30 P. M.: A plate of meat with accessories. Evening, 9 P. M.: A glass of milk.

In the treatment of the anæmic form of obesity, to which chlorotic patients of the better classes are subject, in consequence of sedentary habits and overfeeding, the diet must be so arranged that albumins predominate, whilst carbohydrates should be given sparingly, and as little fat as possible. As the average quantities of the food elements required in such cases, I suggest, 200 grammes of albumin, 12 grammes of fat, and 100 grammes of carbohydrate.

The quantity of fluid taken must be as small as possible, since the deprivation of water may result in a proportionate increase in the solid constituents of the blood, and thus increase its hæmoglobin-richness.

The amount of physical exercise taken by young girls at this period of life must vary according to the circumstances of each individual case. In general, we may recommend for them much active movement, especially in the open air, in order to counteract the effects of sedentary habits and confinement in close rooms. Chlorotic patients must, however, be careful to avoid overdoing their exercise, and in some cases it will be necessary to limit the amount of this very strictly. In severe cases of chlorosis, *Nottnagel*, *Hayem*, and other authorities recommend complete rest in bed for from four to six weeks. This rest-cure can be carried out as far as possible in the open air, and can be combined with systematic massage and the use of passive movements.

I have drawn up the following diet-table for obese chlorotic patients:

	Quantity in Grammes.	CONTAINS OF		
		Albumin.	Fat.	Carbohydrates.
Morning:				
Beefsteak	100	38.2	1.7	.....
A cup of tea.....	150	0.45	.....	0.9
White bread.....	30	2.9	0.2	18.0
Mid-day:				
Meat soup.....	100	1.1	1.5	5.7
Roast meat.....	200	76.4	3.4	.....
Vegetables.....	50	0.8	0.2	4.2
White bread.....	50	4.8	0.4	30.0
Light wine.....	150	.....	.....	1.0
Afternoon:				
A cup of coffee.....	120	0.2	0.67	1.7
White bread.....	25	2.4	0.2	15.0
Evening:				
Roast meat.....	200	46.4	3.4	.....
Vegetables.....	25	0.4	0.1	2.1
Wine	150	.....	.....	1.0
White bread.....	30	2.9	0.2	18.0
Total....	1380	206.97	11.92	97.6

Contains about 1300 calories.

For young girls at this period of life systematic gymnastic exercises are usually valuable, not only for strengthening the muscular system and improving the physique during these years of growth, but also for assisting the functions of respiration, circulation, and digestion. Beginning with the simplest and easiest exercises of chamber gymnastics, the girl gradually proceeds to more difficult and elaborate exercises and to the use of medico-mechanical apparatus.

The clothing of young girls at the time of the menarche must receive attention to this extent, that all articles of clothing should be rejected which increase the tendency already existing to hyperæmia of the genital organs or offer any hindrance to the circulation in general. Above all, the physician must take his part in the contest so long and so vainly urged against the corset. But further, all tight clothing, such as restricts the freedom of movement of the thorax and the abdomen, tight collars, and tight garters — all these must be forbidden; moreover excessively warm underclothing, of the lower extremities especially, which may stimulate the genital organs, must also be prohibited.

As regards the night hours, a thick feather bed is unsuitable. The young girl should sleep on a hair mattress, and the bed clothing should be light. Eight to nine hours sleep is sufficient; in the words of the English proverb, "early to bed and early to rise, is the way to be healthy, and wealthy, and wise."

To live by rule, with regular hours of work and suitable pauses for rest, is of great importance. Among the well-to-do classes also care should be taken that the adolescent girl takes moderate physical exercise for several hours daily; she should go for a good walk, and not spend hour after hour recumbent upon a sofa in idle reverie. Sitting for too long a time, whether engaged in sewing or at the piano, is harmful; working at the sewing-machine is permissible for short periods only, and is indeed at this period of life better altogether avoided. Bicycling is also an unsuitable exercise at this age and readily leads to masturbation. Lawn tennis and croquet, on the other hand, are very suitable active open-air games; in winter, skating may be indulged in if proper precautions are taken against chill; in summer, swimming and rowing. The reading of light literature should be kept under supervision; equivocal novels, such as may give rise to erotic reverie and sensual excitement, must be strictly forbidden. A watch should be kept for any indications of the habit of masturbation; and if the habit exists, appropriate measures should be taken.

Hydrotherapeutic procedures and baths are of great hygienic and therapeutic importance for girls at the menarche. In healthy girls at this period of life, a cold sponge-bath lasting one or two minutes, the temperature of the water ranging from 10° to 20° C. (50° to 63° F.), taken either on rising in the morning or immediately before going to bed, is a valuable means for hardening the whole body; equally useful are cold shower-baths, lasting from a few seconds up to half a minute. If the girl is somewhat anæmic, it will be well for her to take a glass of warm milk or a cup of tea half an hour before the bath, in order to guard against too great an abstraction of heat. Cold bathing in rivers, when available, may also be recommended. In cases in which a considerable degree of anæmia or chlorosis is present, cold baths and every form of strong mechanical stimulation by the use of water, douches and the like, are to be avoided, since we have to fear both excessive abstraction of heat and overstimulation of the nerves. In such anæmic and chlorotic patients, either partial washing with lukewarm water or general lukewarm baths, the temperature of which may be gradually and cautiously lowered, either on rising or at bedtime, have a refreshing and stimulating effect.

In girls who are in other respects healthy, but in whom the men-

arche is delayed, and in whom menstruation, when begun, has been scanty and irregular, cold sitz-baths of short duration, the abdomen being simultaneously douched from a considerable height, or cold shower-baths in combination with powerful abdominal douches, are often of value.

Recently, hot air and vapor baths have been especially recommended for girls suffering from chlorosis, at first, by *Scholz* and *Schubert*, in association with phlebotomy, but also without this. *Kühne*, for example, has seen the most satisfactory results follow the simple use of sudatory baths in cases of chlorosis; improvement was manifested by an increase in the corpuscular richness of the blood, an increase in the hæmaglobin-richness, and an increase in the body-weight. In cases of chlorosis, *Traugott* also has seen favorable results follow the use of hot-air baths and the consequent diaphoresis.

Still more recently *Dehio* and especially *Rosin* have recommended hot baths for girls suffering from chlorosis. In fifty cases of chlorosis, in which other methods of treatment had given negative results, *Rosin* gave three times a week baths at a temperature of 40° C. (104° F.), lasting at first a quarter of an hour, but later half an hour. After the bath, in those strong enough to bear it, a very short cold douche or cold sponging followed; then the patient had to lie down for an hour. The treatment was carried out for from four to six weeks. Each bath by itself had a notable refreshing effect in these patients, and at the end of the course most of the cases exhibited an improvement in all their symptoms, such as other methods of treatment had failed to produce.

The favorable influence exercised by these hot baths, as by steam bath-cabinets, light baths, sun baths, wet packing, and similar sudorific measures, may in part be explained by the dehydration of the system that is thus effected; whilst those who maintain the auto-intoxication theory of chlorosis may regard the diaphoresis as a means for the elimination of noxious substances from the body.

Bathing in water aerated with carbonic acid may be recommended for patients suffering from anæmia and chlorosis at this period of life, for the reason that such baths can be tolerated at a lower temperature than baths of ordinary water. The natural mineral waters containing free carbonic acid, and chalybeate waters rich in carbonic acid, when used as baths, are effective principally in virtue of the carbonic acid they contain, which stimulates the skin; this stimulus being conducted by the nervous system from the periphery to the nerve-centres, is reflected thence, and by irradiation exercises a quickening effect on all the processes of nutrition. These baths are usually taken at a temperature progressively reduced from 32° C.

to 25° C. (90° F. to 77° F.), and each bath lasts from ten to twenty minutes; they are in most cases taken every other day only. For young girls in whom the menarche is delayed, also for chlorotic patients with amenorrhœa and neuralgic manifestations, chalybeate peat baths are indicated, which influence the peripheral nerves by the exercise of a gentle yet considerable thermic stimulus. These chalybeate peat baths have further been shown to increase the hæmoglobin-richness, the corpuscular richness, and the specific gravity of the blood, transitorily after each bath, but to some extent permanently also, a certain increase enduring after the course is over.

Young girls suffering from disturbances of their general health dependent upon a scrofulous or rachitic habit of body may with advantage be sent to brine baths, especially to such as are situated in the Alps or other mountainous regions. These weakly, lymphatic, scrofulous girls, suffering from scanty or irregular menstruation, may also practice sea-bathing with advantage, especially at watering places on the sea coast, where the waves are powerful. In such cases, however, it is advisable in the first instance to take artificially warmed sea-water baths, before proceeding to actual sea-bathing.

If the sensibility of a chlorotic patient is so great that she can endure neither peat baths nor carbonic acid containing mineral water baths, we must add to the latter, in order to make their action milder, decoctions of chamomile, wheat bran, malt, and the like.

In cases in which nervous symptoms predominate, with an apathetic, melancholic frame of mind, aromatic herb baths are sometimes useful. For this purpose such herbs should be employed as contain a notable quantity of ethereal oils, such as sage (*salvia officinalis*), wild thyme (*thymus serpyllum*), hyssop (*hyssopus officinalis*), wild marjoram (*origanum vulgare*), rue (*ruta graveolens*), archangel (*archangelica officinalis*), levesticum (*levisticum officinale*). Equally useful are the balsamic pine needle baths, for which the fluid obtained by the distillation of pine needles (*pinus sylvestris*), freshly collected day by day, is employed.

As regards the climatic conditions suitable for adolescent girls suffering from the disorders of the menarche, from the nervous conditions associated therewith, and from chlorosis, residence either in the mountains or at the seaside is especially to be recommended. An altitude of about 1,200 metres (4,000 feet) is the most suitable, being that at which the peculiar characteristics of mountain climates are most fully developed. The influence of such a climate on hæmatopoiesis has to be taken into consideration, as well as its special influence on the menstrual function.

Even though it cannot yet be regarded as fully determined whether the increase observed by *Viault*, *Egger*, and *Mercier*, in the

corpuscular richness and hæmoglobin-richness of the blood in consequence of residence in a mountain climate, is lasting or merely transitory, yet it is certain that the hæmatopoietic organs are favorably influenced by such residence, and that the good results are augmented by the stimulating effect mountain air exercises on the appetite and the digestion. *Lombard* has moreover observed, that at a high altitude the menstrual flow is more abundant and dysmenorrhœa is less common. For young girls, therefore, suffering from irritable conditions of the heart, increased frequency of the pulse, or increased arterial tension, and for those also in whom the resisting power of the organism appears deficient, a visit to a mountain health resort situated amid forests may be recommended. For scrofulous girls a visit to the coast of the North Sea is especially suitable. For the slighter forms of anæmia, a sea voyage, in which the benefits of sea air can be obtained more fully, and for a longer period, may be advised; but such a voyage is quite unsuitable for those suffering from severe anaemia or chlorosis.

Such very weakly, intensely anæmic and chlorotic patients should spend the winter in some southern health resort.

The skin, in which disturbances so readily occur at the time of the menarche, requires careful attention, all the more because it is precisely at this age that young girls have the greatest need of their personal charms. The skin of the face, which is often disfigured by comedones and acne, must be carefully guarded against the accumulation of sebum in the sebaceous glands by sedulous washing with warm water and a good soap. If the seborrhœic⁸⁰ process in these glands becomes at all severe, ordinary soaps are unsuitable, and a potash soap must be used, such as *sapo viridis*, or *spiritus saponatus kalinus*, which have great power of dissolving fats.

The best way of dealing with seborrhœa is according to *Spietschka* and *Grünfeld* the following: The washing is best effected in the evenings, when the skin will not again for many hours be exposed to the fresh air, to wind, or to dust. Pour into a basin about a pint of warm water and add from one to two teaspoonfuls of spirit of soap (equivalent to the *linimentum saponis* of the British Pharmacopœia) or as much soft soap as can be taken up on the end of a table-knife. The water is then stirred vigorously till a good lather is formed, and with the water and the lather the face is thoroughly washed. The skin must then be carefully dried, and thereafter it is well to smear it with some greasy material, such as boric vaseline, in order to prevent the plugging of the pores with

⁸⁰ Regarding the significance attached by the author to the words *seborrhœa* and *seborrhœis*, see note to page 107.

dust, and to protect the sebum subsequently exuded from dessication. On the next day the washing should be repeated only if the face has become covered with sebum within an hour or two after the first washing. If the exudation is less free, the eyes only should be washed with fresh water, whilst the rest of the face should not be wetted, but merely be wiped with a dry face towel lightly dusted with toilet powder, in order to remove any accumulation of sebum.

The skin of the genital regions must be carefully cleansed, especially in cases in which there is a tendency to hypersecretion of the sebaceous glands, to eczema, or to herpes progenitalis; subsequently it should be powdered, and pads of absorbent cotton-wool dusted with toilet powder should be placed in the labial furrows.

It is of great importance that in girls at this time of life gynecological examination should be undertaken only in cases of the utmost need, and this restriction should be especially inflexible in the case of girls with a neuropathic predisposition. Instances have been observed in which a vaginal examination, the introduction of a vaginal speculum, or the use of the uterine sound, has determined the onset of a psychosis. Still more does what has been said hold true of local treatment in gynecological cases. Repeated passage of the uterine sound, cauterization of the cervix, and the manipulations of gynecological massage, make a very deep impression upon the mind of a girl, and give rise to morbid ideas and erotic storms, so that even in those with a powerful constitution, various neuroses, neurasthenic states, and even mental disorders may result. If in such cases, especially in girls of a neuropathic temperament, gynecological treatment is quite indispensable, a single, though energetic, operative procedure is to be preferred to a number of successive, though taken singly less extensive, manipulations of and in the female genital organs. The importance of this proposition has been repeatedly established. *Sænger*, for instance, points out as a fact to be regretted that uterine cauterization with mild caustics is far too frequently undertaken; and *Odebrecht* from the same standpoint proclaims the advantage of a single curetting as compared with milder intra-uterine impressions repeated during a course of treatment lasting many months. On the other hand, the physician must bear in mind the fact, established by the record of a very large number of cases, that in women predisposed to psychoses severe gynecological operations are apt to lead to the actual appearance of mental disorders, or to the exacerbation of mental disorders which have previously been very mild or have merely threatened to appear. Careful consideration is needed, on the one hand as regards the severity of the disease of the genital organs, and on the other as regards the resisting power, temperament, and constitution of the

girl concerned, and in many cases a consultation between the gynecologist and the neurologist is expedient.

A very powerful influence on the physical and moral well-being of the girl at puberty is exercised by her domestic upbringing. The general truth of *Gæthe's* saying, that the circumstances into which we are born exercise a determining influence on the whole life, being admitted, we have to remember that this applies with especial force in the case of girls.

The educational views which obtain at the present day among the upper ten thousand, are by no means calculated for the production of a woman healthy in body and sound in mind. From the time when the young girl becomes sexually developed, the claims which society makes upon her become pressing. Every day, by a number of stimuli, her curiosity and her desires are directed toward sexual matters. Visits to museums, picture galleries, and theatres, the perusal of modern romances, the free mingling of the sexes in all places of amusement — all these combine to awaken prematurely an instinct to which the "old fashioned" methods of education allowed a much more prolonged slumber. In other cases, the mother's supervision of the developing girl is hindered and rendered insufficient because the mother herself is claimed by her society duties and taken much away from her home. In addition, the young brain is overburdened with mental work, the modern idea of the equality of the sexes in matters of love is instilled, and a desire is artificially evoked, and is matured by a certain idle vanity, to indulge the "natural" instincts — to manifest sexual passion and to indulge it to excess — and thus the modesty so natural and so becoming to young girls is completely lost. Nourished in such a soil, neurasthenic and hysterical states, disorders of menstruation, and masturbation, cannot fail to flourish.

In these respects also a change is requisite, and a mode of upbringing must be inculcated from which everything likely to inflame the sexual impulse is removed. For the adolescent girl a systematic alternation of work and recreation must be arranged. From great entertainments where she will mix with young men, from theatres, evening parties, and balls, the young girl at the time of the menarche, at the period when menstruation commences, must as far as possible be kept away, and such pleasures must be reserved for a more advanced stage of this period of development. Intellectual overstrain, the overtaxing of the young head, must be avoided; the acquirement of knowledge must take place gradually and slowly, and in a manner adapted to individual peculiarities. Intercourse with female friends also requires supervision in respect of the moral characteristics of these latter. Religious reverie must be

avoided, but also to be avoided is the modern nihilism in respect of religion and good morals. Books must be carefully chosen in order that the imagination may remain pure and in order that girlish illusions may not be prematurely destroyed. Domestic recreations in the way of games, music, singing, painting, and other forms of artistic culture, are of importance for the development of a strenuous faculty for learning. Travel in regions where the scenery is beautiful, forms a most valuable means for the ennoblement of the intellect and the emotions.

Additional matters demanding attention are, as already mentioned, the suitability of the diet, and proper physical exercise. All stimulating articles of food are to be avoided, the excessive use of meat is to be forbidden, and a sufficient mixed diet, containing both animal and vegetable substances, is to be prescribed. Tea and coffee should be taken as sparingly as possible, and alcoholic beverages must be absolutely prohibited. The regulation of the bowels is of great importance. Young girls should accustom themselves to evacuate the bowels every day at a fixed hour, the best time to adopt being either immediately on rising or just after breakfast. Constipation is very apt to lead to the production of irritable conditions of the genital organs.

We can point out as a happy instance of modern progress that the practice of certain physical exercises has actually become the fashion for young girls. Gymnastics, with or without apparatus, swimming, skating, and lawn tennis, involve a number of bodily movements advantageous for the health; and in connection with most of these the enjoyment of fresh air offers an additional favorable influence. Bicycling, however, at this period of life is open to many objections, not only on account of the likelihood of direct injury to the genital organs now in course of development, but also on account of the impulse it produces toward onanistic manipulations.

Especial attention must be paid to the clothing, regarding which the requirements of fashion so often conflict with those of hygiene, the victory, unfortunately, in most cases falling to the former. The period of the menarche is indeed usually regarded as the proper time for the young girl to begin wearing a corset, if it has not been worn before. In this connection *M. Runge* makes the significant remark: "As long as bodice and skirt form the two principal articles of woman's clothing, the corset or some similar article cannot be dispensed with. The vicious features in the corset are its constriction of the thorax, with the object of giving the woman a 'figure,' and the introduction into its substance of strips of whalebone or steel in order to give firmness to the figure. The harm done by the

former feature, the compression of the abdominal viscera, the corset liver (lacing liver, constricted liver, Ger. *Schnürleber*), the movable kidney, etc.—all are so well known that they need not be particularly described. But the strong pressure from above has a deleterious effect upon the internal genital organs also, leading to passive hyperæmia and to displacements. The ‘bones’ of the corset take part in the compression, and they replace the functions of the muscles of the back. If a woman who has long worn a corset lays it aside later in life, she complains that she is no longer able to hold herself upright. In consequence of insufficient work the muscles of the back have become incapable of keeping the back straight. The corset, then, must neither constrict the body, nor must it contain ‘bones.’ An article of clothing analogous to the corset is, however, required for the support of the skirt and the petticoats that clothe the lower limbs. These latter are usually fastened by means of bands which encircle the body above the crest of the ilium. In order to give these bands a sufficient hold, this region of the body is compressed by the corset. The burden of skirt and petticoats is thus borne by a furrow, above the pelvis and below or in the region of the asternal or false ribs, which is in great part artificially produced. All this is bad. In order to avoid the necessity for any constriction, the petticoats should be fastened to the corset, and this latter should be supported from the shoulders by means of shoulder-straps or braces crossing one another behind. No constriction of the thorax then occurs, and if the corset has suitable supporting pouches for the breasts, and the wearer is accustomed to hold herself erect, the figure of a well-formed woman thus attired is far from unpleasing, and is, above all, natural. If the weight of skirt and petticoats is too great to be borne by the shoulders, the burden can be divided, some being fastened to the corset, others tied round the waist. This method is less to be commended, but may be regarded as a permissible middle course. If chemise and drawers are woven in one piece, as in the ‘combination’ under garment, there is one article the less to be attached to the corset. Recently a number of corsets and articles of clothing have been made in accordance with these principles.

“The growing girl, then, may wear a soft corset with shoulder-straps, made to measure, to which all the garments clothing the parts below the waist should be made to fasten. It must unfortunately be admitted that this rational mode of arranging the clothing cannot be adapted to the ‘low dress’ which etiquette demands on so many occasions for evening wear, since with the latter the shoulder-straps cannot be worn.

“It is most unhygienic for women to wear, as they so often do,

drawers that are widely open. Both cleanliness and the need for an equable warmth demand that these garments should be closed between the thighs, not to speak of other reasons."

In order to diminish the sexual impulse in girls at the menarche, where this impulse has developed prematurely or is abnormally intense, and even in later years with the same end in view, it is necessary, not merely that the diet should be suitable and non-stimulating and that the educational environment should be satisfactory, but above all that there should be regular occupation and regular physical activity. *Ribbing* rightly calls attention to his experience in dealing with animals, that equally in the case of the stallion and of the mare, the whole of life may without difficulty be passed in complete abstinence from sexual gratification, provided that the diet is suitable, being neither too rich nor too meagre, and that the animal has regular occupation of a nature and degree adapted to its powers. In these animals a certain amount of disquiet, of restlessness, of sulky irritability, etc., may indeed be noticed at times, but these manifestations are to be overcome by mingled gentleness and firmness, aided now and again also by mild chastisement, but altogether without any severity. "Chastity," says *Oesterlen*, "is possible only when the mode of life is simple and regular, and is characterized by appropriate self-command and frugality. For this reason it is rarely encountered in palaces and similar places, in which from youth onwards every one can do what he pleases; but just as little is it really practicable amid conditions of lack of culture, rudeness, and poverty."

From the point of view of education, what *Moreau* wrote a hundred years ago is of importance: "In the ordinary course of nature the young woman at the time of the first appearance of menstruation is still in full possession of those amiable qualities of blamelessness and chastity which we are accustomed to denote by the term *moral virginity*. To an honorable and pure-minded man this beautiful attribute of budding womanhood is much dearer and more estimable than physical virginity. By libertines only is the latter regarded as a most valuable possession, since it furnishes a powerful stimulus to their jaded imaginations. But moral virginity and physical virginity are not always and necessarily associated, for either can be present in the absence of the other. Physical virginity may be destroyed by diverse forms of violence, and yet moral virginity may remain pure and uninjured amidst its ruins. Thus the two are widely different one from the other, widely different also are they in value and significance."

What *Eulenburg* says regarding the prophylaxis of sexual neurasthenia in general is true regarding the sexual life of the girl at this

period of life. "What is needed," he writes, "is the control of educational influences with these ends in view, that, on the one hand, the sexual excitability of developing youth shall be diminished and kept within bounds, and that nevertheless, on the other, the urgently needed enlightenment shall be afforded to the young people at the proper time and in a suitable form. How these aims are to be effected cannot be explained in generally applicable propositions. It is a matter which must be left to the tact of the parents and of other members of the family, who will be guided by the insight they have acquired into the mental life of those concerned. * * *. Children inclined to onanism must be carefully supervised by day and by night; they must be protected from all stimulating things and from bad company; in boarding-schools it is the common dormitories that require the most strict, most careful, and most continuous control. In the case of auto-onanists, female as well as male, we must enquire into the possible existence of local stimulating influences, among which, in both sexes, oxyuris must be mentioned — but in truth it is rare for such local conditions to be the exciting cause of masturbation. A healthy mode of life in respect of clothing, sleep, and diet, and the systematic practice of bodily exercises to the point of considerable fatigue, are the most effectual means of counteracting the noxious propensity to onanism."

A high degree of freedom permitted to girls from a very early age is, as *Rousseau* already maintained, by no means favorable to the preservation of virginity.

A wise mother or a wise instructress can do much towards the preservation of physical and moral virginity, by enlightening her daughter or pupil at the right time and in a proper manner as to the nature of the sexual processes, and their significance for the whole life of woman. Ignorance in this respect, equally with pseudo-knowledge, entails many dangers. I regard it as indispensable that the adolescent girl should in good time learn from her mother the nature of menstruation, lest she should first receive enlightenment in an unfitting manner from some more experienced female friend. The mother should explain that the impending flow of blood is a natural process, unattended by danger, but indispensable to the sexual life, and a characteristic part of the process of "growing up."

The knotty and important topic of how the young girl may best receive sexual enlightenment from her mother, is discussed by *E. Stiehl* in her notable work "A Maternal Duty."⁸¹ The authoress points out that this enlightenment must not take place suddenly and without apparent motive, but that the mother must in a gentle

⁸¹ *Eine Mutterpflicht.*

and gradual manner introduce to her child the secrets of nature. A beginning may be made by teaching the child to observe the nature and growth of plants; then she may be led to interest herself in the family life of animals; and thus an easy way is found to answer the questions connected with reproduction—to answer them in a manner at once true and befitting.

Let the mother indicate to her child the methods employed by nature for the preservation of the life of the young plant; let her demonstrate in a flower the stamens and the pistil as male and female organs respectively; and let her explain how when the pollen-grain reaches and fertilizes the tiny ovule in the ovary, this ovule becomes capable of development into a large seed containing an active rudimentary plant, which latter itself enlarges to become a new full-grown specimen of its kind. The opportunity may then be seized to draw attention to the resemblance between the little ovules in the ovary of the flower and the minute ova by means of which all animal life reproduces its kind. Proceeding further, an earnest and thorough introduction to the sanctity and responsibility, the perils and duties, of the sexual life, is urgently required by the young girl before she proceeds either to marriage or to an economically independent mode of life.

Not only in America and England, but now also in Germany, there exist excellent books which may actually be put into the growing girl's own hands, by means of which she will be introduced in an intelligent manner to a knowledge of the method of reproduction in the human species.

Often enough, when the mother is lacking in intelligence or sympathy, it will be the duty of the physician to give this enlightenment to the young girl. The interpreter of such tidings at the time of love's dawning will be the family doctor, to whom the girl and her family have been confidently accustomed to turn for information regarding the bodily state and well-being. He is accustomed to remove many a veil without any offense to maidenly modesty. Many sexual disorders and much sexual aberration may thus be prevented.

Certain definite hygienic rules must now be prescribed. First of all, the strictest cleanliness must be observed, not only in the intervals, but also during menstruation. The prejudice against changing the under linen during the flow must be overcome, and care must be taken that at this time the external genitals are washed twice daily with water at a temperature of 26° C. to 28° C. (about 80° F.), and a wad of absorbent cotton-wool or a piece of clean linen (sponges are not to be used for this purpose); any article of underclothing

that becomes soiled with blood must be changed. Most useful are the so-called "sanitary towels," made of sterilized absorbent cotton-wool, fastened to a linen band which surrounds the waist, or simple pads of absorbent material may be used, kept in place by means of a bandage. During menstruation, full baths, warm or cold, are to be avoided, likewise long walks, riding, long journeys by rail, gymnastics, with or without apparatus, skating, lawn tennis, and bicycling; dancing, above all, must be prohibited, since it involves a combination of several noxious influences — the very active movement, which produces hyperæmia of the genital organs, sexual excitement, loss of sleep, long hours spent in close rooms, prolonged voluntary retention of urine, and the risk of a chill. Singing, also, must be discontinued during menstruation, since otherwise an injury to the voice is very likely to result. A certain limitation in respect of physical and mental activity is indicated as a general precautionary measure during menstruation, but this measure must not be pushed to excess, so that the habit is acquired of resting completely during the period, passing the days on a sofa. The favorite practice, in cases of scanty menstruation, of taking hot foot-baths is to be rejected. At the conclusion of each menstrual period, however, a tepid bath should be taken. The knowledge we have now acquired of the rhythmical "menstrual wave" process (see p. 19 *et seq.*) points to the practical conclusion that the physician should not direct his attention to the actual menstrual period only, but also, and more than has hitherto been customary, to the premenstrual period, in which temperature, blood-pressure, and excretion of urea attain their acme; especially should this be done, with the aim of prescribing suitable hygienic precautions, in cases in which the menstrual discharge is very profuse or in which nervous manifestations accompany menstruation.

Important is it also for the physician to take precautions against the practice by young girls of unduly prolonged voluntary retention of the urine, resulting in over-distension of the bladder; also against the performance of very active movements and against powerful muscular efforts when the bladder is in a distended state. All of these are liable to result in displacements of the uterus.

During menstruation the diet should be sufficient, but free from stimulating elements. When the menstrual flow is greatly in excess, strong tea and coffee, wine, and beer should be forbidden; conversely, when menstruation is scanty, an invigorating diet is especially indicated, and the use of strong wines. According to the investigations of *T. Schrader*, in order to maintain the nitrogenous balance

during menstruation, it is necessary to give the following daily diet, representing a heat value of 2,013 to 2,076 calories:

125-150 grammes of fowl.
 100 grammes of butter.
 125-140 grammes of white bread.
 150 grammes of brown bread.
 70-80 grammes of eggs.
 600 grammes of coffee.
 600 grammes of soup.
 560 grammes of Seltzer water.
 20 grammes of salt.

For chlorotic girls the following diet may be recommended during menstruation. Before rising a pint of milk should be taken slowly, in sips, during a period not exceeding half an hour; for the first breakfast (see note to p. 112), tea or coffee with an abundance of milk, a considerable portion of meat (roast beef, cold fowl, cutlets, or beefsteak); for the second breakfast, a tumbler of milk, bread, butter, and a couple of eggs; for midday dinner, a good helping of fresh meat so cooked as to be easily digested, green vegetables, potatoes, farinaceous pudding, stewed fruit, and a glass of burgundy or claret; at 4 P. M., coffee and bread and butter, or a tumbler of milk; at 7 P. M., a similar meal to the midday dinner, but lighter; no supper. In this diet-table, which represents a heat-value of about 2,200 calories, albumin and fat are present in abundance (182.8 grammes albumin and 763 grammes fat), but carbohydrates in small quantity only (176.9 grammes).

For those chlorotic patients who find it difficult to digest much butcher's meat, the necessary quantum of albumin must be supplied by increasing the amount of milk, soup, and the white varieties of flesh (chicken and the like), giving also a considerable amount of the more easily digested vegetables, with fruit, beer, and a little claret. For such cases *Desqué* has drawn up the following diet-table, representing 3,290 calories and containing 150 grammes of albumin, 110.7 grammes of fat, and 449.6 grammes of carbohydrate; meat is given once a day only:

- 7.30 A. M.—Half a pint of milk, 50 grammes roll, 10 grammes butter.
 10 A. M.—300 grammes apples, strawberries, or cranberries, 50 grammes roll, 10 grammes butter.
 12.30 P. M.—200 grammes of beefsteak, 100 grammes of macaroni, 300 grammes of bread, 400 grammes of spinach, 200 grammes of stewed apples or gooseberries.
 4 P. M.—200 grammes vegetable-peptone-cocoa, 50 grammes roll, 10 grammes butter.
 7.30 P. M.—200 grammes rice-broth, 500 grammes buttermilk, 100 grammes bread, 10 grammes butter, 200 grammes salad, 300 grammes uncooked pears, 40 grammes curds.

In cases of profuse metrorrhagia in girls, *von Winckel* recommends in addition to rest in the recumbent posture, a diet containing large quantities of fluid, and much easily assimilable albuminous nutrient material, all stimulating articles and those likely to cause nausea and vomiting being avoided. He gives the following diet-table:

7 A. M.—250 grammes of milk.

9 A. M.—250 grammes of bouillon, 1 egg, 20 grammes of brandy.

11 A. M.—250 grammes of milk.

1 P. M.—100 grammes of roast meat, 250 grammes of rice-broth with 5 grammes of somatose, and 150 grammes of claret.

3 P. M.—250 grammes of milk.

5 P. M.—1 egg, 20 grammes of brandy.

7 P. M.—250 grammes of bouillon or white soup with 5 grammes of somatose.

As a beverage in the intervals, weak cold tea is allowed. When the hæmorrhage has ceased, the following beverages are suitable: oatmeal, cocoa, Pilsener beer (one pint daily), milk (2 to 3 pints daily), claret (a half bottle daily). For food, the lighter varieties of meat, 200 to 300 grammes daily, sweet-bread, pigeon, ham, nutrient and easily digestible vegetables, spinach, carrots, and pea-soup, may be recommended.

In cases of amenorrhœa or scanty menstruation, especially when due to anæmia or to underfeeding, mental excitement, or over-exertion, warm baths at a temperature of 28° to 29° R. (90° to 92° F.), rubbing the body with wet towels, and warm sitz-baths, are of good service.

[NOTE: Although in this translation the English equivalents of the measures used on the Continent have as a rule been appended in parenthesis, this has not been thought necessary in the case of the diet-tables, since even in English works these are commonly stated in terms of the metric system. It may here be mentioned that, as regards fluid measures, 250 grammes (a quarter of a litre) is roughly equivalent to half a pint, an ordinary tumblerful or breakfast-cupful; and that, as regards solid measures, 30 grammes are equivalent to a very little more than an avoirdupois ounce.]

Menstruation.

Menstruation is the name given to the process which manifests itself in the human female after the age of puberty by the discharge from the genital organs at regular four-weekly intervals of a mucosanguineous secretion. This discharge is not merely the result of a local hyperæmic condition, but is the expression of a periodic excitation of the entire nervous system and blood vascular system, intimately related with the whole sexual life of woman; this excitation is itself dependent upon the process of ovulation, an incident in the series of manifestations that arise from the periodic undulatory movement in the vital processes of woman.

The Mosaic law regarded the process of menstruation as **unclean** in nature; the menstruating woman was unclean, and must be purified in a prescribed manner. In the fifteenth chapter of Leviticus, vv. 19-29, we read: "And if a woman have an issue, and her issue in her flesh be blood, she shall be put apart seven days: and whosoever toucheth her shall be unclean until the even. * * * Every bed whereon she lieth all the days of her issue shall be unto her as the bed of her separation. * * * But if she be cleansed of her issue, then she shall number to herself seven days, and after that she shall be clean. And on the eighth day she shall take unto her two turtles, or two young pigeons, and bring them unto the priest, to the door of the tabernacle of the congregation."

In a similar manner the adherents of the faith of Islam regard a menstruating woman as unclean.

This view is found also in the earliest medical writings, alike in the early Indian book of *Susruta* and in the later writings of *Hippocrates*, and it persists to the present day in the use of the expression "monthly purification." *Susruta* teaches that in India menstruation begins at the age of twelve, and recurs monthly, the flow lasting three days. In the Jewish Talmud it is asserted (see "La Médecine du Talmud," by *Dr. Rabbino-wicz*) that menstruation begins as soon as the girl has two hairs on the pubic region, or at the age of twelve, even in the absence of any growth of the pubic hair. The menstrual blood is quite peculiar in its characters. Thus, *Raschi* relates, the mother of the King of Persia exhibited sixty varieties of blood, and among them *Rabba* was able to detect which was the menstrual blood. According to a rabbinical authority, a woman can become pregnant as soon as she has completed her twelfth year. As signs of puberty, *Rabbi Jossé* mentions the appearance of a fold beneath the nipple, *Rabbi Akiba*, the erection of the nipples, *Rabbi d'Azai*, the appearance of a dark areola around the nipples, *Rabbi Jossé*, the recession of the nipple under pressure followed by its gradual protrusion when the pressure is removed, also the softening of the mons Veneris (in consequence of the deposit of fat in its substance). As prodromal signs of the first appearance of menstruation, the Talmud mentions, pain in the region of the umbilicus and in the uterus, flatulence, shivering, white flux, heaviness in the head and the limbs, and nausea.

The blood discharged during menstruation has certain peculiar properties. It is always fluid, and rarely contains fibrinous clots, it is always mixed with a larger or smaller quantity of mucus, which gives it a sticky character; the reaction is alkaline, the smell characteristic. Only when the bleeding is very profuse are coagulated masses evacuated. On microscopical examination of menstrual

blood, we detect erythrocytes and leucocytes, the proportional number of the latter being greater than in pure blood; there is an admixture also of epithelium from the genital mucous membranes, cylindrical cells from the uterus, flattened cells from the superficial layers of the stratified scaly epithelium of the vagina, also various micro-organisms and granular detritus. At the beginning of each menstruation, the admixture of mucus is greatest, so that the discharge sometimes has the appearance of blood-stained mucus; but during the height of the discharge the consistency is almost that of pure blood. The quantity of blood lost at each period is said to vary from 90 to 240 grammes (about 3 to 8 fluid ounces); but in tropical climates the average is said to be 600 grammes (20 ounces). According to the accurate analysis of *Denis*, menstrual fluid contains in a thousand parts:

Total solid constituents	175.00
Comprising	
Fat	3.90
Blood-corpuscles	64.40
Albumin.	48.30
Extractives ..	1.10
Salts	12.00
Mucus	45.30
	<hr/>
Water	825.00
	<hr/>

Both the quality and the quantity of the blood are subject to great variations. Thus, for instance, *Bouchardat* estimates the solid constituents at 99.20 per mille, *Vogel* at 161 per mille, and *Simon* at 215 per mille. The amount of blood discharged during menstruation depends upon the temperament, the constitution, and the occupation, of the woman concerned. It is greater in vivacious brunettes than in phlegmatic blondes, greater in southern women than in those dwelling in the north, greater in town dwellers than in women living in the open plains, greater in those whose mode of life is sedentary than in those engaged in some active occupation.

Similar considerations apply with regard to the duration of each period. The mean duration is in the great majority of cases from four to five days, being generally the same in successive periods in the same individual; in exceptional cases the flow may last a week or more. Menstruation lasting more than eight days must be regarded as abnormal.

Krieger has collected data relating to the duration of the individual periods. He found the duration constant in the great majority of cases, *i. e.*, 93.285 per cent.; but variable in a small minority, *i. e.*, 6.715 per cent.

The periods in which the duration was regular did not always last precisely the same number of days, the duration in many cases being 3 to 4 days, 5 to 6 days, etc.; but the same duration recurred regularly at each successive period, so that all these instances must be reckoned among the periods of regular duration. The duration must be regarded as irregular or variable in those cases in which the variation was from 2 to 4 days, 3 to 8 days, etc. Sometimes a regular three-day or five-day period becomes transformed into an eight-day period; or conversely an eight-day period into a four-day period.

Among the cases in which the duration was regular, it amounted

Most frequently to 8 days, in.....	26.695 per cent.
Next in frequency was a duration of 3 days, in.....	20.762 per cent.
Next, a duration of 4 days, in.....	16.949 per cent.
Next, a duration of 5 days, in.....	11.864 per cent.

L. Mayer has also drawn a distinction between constant and variable duration of the menstrual periods. Among 4,927 women, he found 4,542 (92.185%) in whom the duration was constant, and 385 (7.815%) in whom it was variable. Of the constant periods, the duration was:

8 days in 1182 women, that is in.....	26.024 per cent.
4 days in 829 women, that is in.....	18.252 per cent.
3 days in 731 women, that is in.....	16.094 per cent.
5 days in 730 women, that is in.....	16.072 per cent.

An extremely short duration, less than 24 hours, was found in 70 women, an extremely long duration, 7 to 14 days, was found in 175 women, and finally a duration exceeding 14 days was found in 19 women.

The mean duration in these cases was 5.387 days.

The results obtained by *Szukits*, who investigated the duration of the periods in 1,013 women, are somewhat divergent from the above. He found:

A duration of a few hours only in 95 women, that is in..	9.38 per cent.
A duration of 1 to 2 days in..... 66 women, that is in..	6.51 per cent.
A duration of 3 days in 407 women, that is in..	40.17 per cent.
A duration of 4 days in 171 women, that is in..	16.88 per cent.
A duration of 5 to 6 days in..... 115 women, that is in..	11.35 per cent.
A duration of 7 to 8 days in..... 118 women, that is in..	11.63 per cent.
A duration of 9 days and upwards in 41 women, that is in..	4.05 per cent.

The mean duration in these cases was 3.87 days.

The mean duration of the menstrual flow is:

In Paris	5 days.
In London	4.6 days.
In Berlin	4.5 days.
In Copenhagen	4.3 days (according to Mayer, 5.3 days).
In Austria	3.8 days.

The interval between one menstruation and the next (the period that elapses, that is to say, between the commencement of one period and the commencement of the next) is in the great majority of cases twenty-eight days. The recurrence in many women is extraordinarily exact, not merely as regards the day, but even as regards the hour of the day. The twenty-eight-day type of menstruation is found in about 70 per cent. of the cases; in the remainder, the thirty-day type is most frequent, and next to that the twenty-one-day type. The periodicity of menstruation in any individual may however be very irregular.

The quantity of blood lost during menstruation varies within wide limits; according to approximate estimates the usual loss at a single period, is from 90 to 240 grammes (about 3 to 8 fluid ounces). The following summary statement is made by *Krieger* regarding the quantity lost in different social circumstances and in various nationalities:

The amount of blood lost and the duration of the flow are less in strong, healthy women, leading an occupied, active, and regular life, especially in countrywomen and in women who are poor and chaste, than it is in delicate, weakly women, leading a sedentary life, whose diet is abundant and stimulating, and who are accustomed to an ultra-luxurious and enervating existence. In nuns, for example, the quantity of the menstrual discharge gradually declines; shortly after their entrance into the cloister, various irregularities are apt to occur, but ultimately the flow becomes exceedingly scanty and lasts for a single day only. Climate also has a great influence, for in hot countries women usually menstruate very abundantly, whilst in cold countries the flow is scanty, and often appears only in the warmer months of the year. Of the Lapp and Samoyede women this was already reported by *Linnaeus* and *Virey*. *Tilt* further relates that Eskimo women menstruate only during the summer months, and even then scantily. In southern France, according to *Courty*, the quantity varies from 120 to 240 grammes (about 4 to 8 ounces); but it may rise to 300, 350, and even to 500 grammes (about 10, 12, and 16½ fluid ounces). In the tropics, severe menorrhagia is said to be common; and the fact was already known to *Blumenbach*, that women of European descent born in the tropics not infrequently succumb to hæmorrhage during childbirth.

L. Mayer has endeavored to determine the relations between the quantity and the quality of the discharge, and distinguishes the regular composition, when a considerable quantity of dark-tinted, fluid blood is passed, from the irregular composition, when a small quantity of blood, usually pale in color, is passed, or an excessive quantity of dark blood, often coagulated, or a discharge of varying composition.

Of 4,542 women questioned by *Mayer* in regard to this matter, there were:

2,998, that is 66.006 per cent., in whom the composition was regular.

1,544, that is 33.994 per cent., in whom the composition was irregular.

and among the latter the discharge was

Scanty and for the most part pale in 511; that is..... 12.250 per cent.

Profuse or profuse and coagulated in 838; that is..... 18.428 per cent.

Variable in 196; that is..... 4.315 per cent.

Investigation regarding the individual variations that occur in this respect among women, showed that blondes usually menstruate more profusely than brunettes, and that in the former also the duration of the individual periods is longer.

The loss of blood must be considered less in respect of its absolute quantity than in respect of the effect which continued observation shows its loss to have upon the organism. If the loss of blood continues to have an effect after the flow has ceased, if a woman recovers but slowly, or even fails to recover fully from one loss before another begins, if symptoms of increasing anæmia become apparent, the bleeding must be regarded as a pathological perversion of normal menstruation. Pathological is it also if the menstrual flow does not exhibit the normal slowly rising and slowly declining curve, but sets in profusely, ceases or almost ceases for a time, and then again suddenly recurs. In some cases the flow is not profuse, but lasts for a long time, and owing to this long duration it has a debilitating effect, especially in anæmic and chlorotic individuals.

As a rule, in normal menstruation, the admixture of the alkaline cervical mucus suffices to keep the menstrual discharge fluid and to prevent the formation of fibrin. On the other hand, the discharge of coagulated masses of blood will alone suffice to indicate an abnormally free and rapid flow of blood.

The commonest type of menstruation is the more or less regular recurrence of the flow at intervals of twenty-eight days. Variations in this respect are, however, very frequent, and are dependent upon constitution, position in life,* and race. In general it may be said that in persons of strong constitution, the type of menstruation is much more regular, than in persons of a weakly, delicate constitution; that in vivacious, ardent natures the menses more readily anticipate the expected period of their return, whereas in those of a flaccid, lymphatic temperament a retardation is more likely to occur; and that amongst women of the upper classes of society the type of menstruation is far more frequently irregular than amongst women of the working classes and amongst countrywomen. Whereas in many women the regularity of the menstrual rhythm

is so precise that the flow recurs, not merely at regular intervals of twenty-eight days, but even time after time at exactly the same hour of the day—in other cases the interval between two periods may vary from twenty-one to thirty days.

L. Mayer, who made observations on the type of menstruation in 5,671 women, and tabulated his results, distinguishes between constant and inconstant intervals. Among the constant intervals he enumerates those forms, both regular and irregular, which do not during the whole life of the individual undergo transformation into another form, but remain always of the same type. If, for instance, in any individual the interval is always either two or eight weeks, in that woman menstruation is indeed irregular, but constant in type. If, however, for some years she menstruates at intervals either of two or of eight weeks, and then proceeds to menstruate at intervals of four weeks, her menstruation is of the inconstant type. *Mayer* found among his 5,671 cases

The constant type in 4,981 women, that is in.....	87.83 per cent.
The inconstant type in 690 women, that is in.....	12.16 per cent.

Of the cases in which the type was constant there were 69.68 per cent. in which the regular period of four weeks obtained, and 20.31 per cent. in which it was irregular in the sense above defined. Among these latter, the commonest periods were 15 to 21 days and 22 to 27 days. The same author observed the irregular type of menstruation in nearly one-fourth of the women belonging to the well-to-do classes.

According to the observations of *Krieger* on 481 cases in which the periods were regular, that is, in which the intervals in each case were equal in duration, the time from the commencement of one period to the commencement of the next was:

28 days in.....	70.80 per cent.
30 days in.....	13.74 per cent.
21 days in.....	1.66 per cent.
27 days in.....	1.45 per cent.

As regards the season in which menstruation first appears, *Krieger* states that in one-half of the women examined by him menstruation had begun in the autumn season, in the month of September, October, or November.

Szukits, as a result of an investigation into the menstrual functions of Austrian women, determined that among 1,013 women menstruation occurred:

Every 28 to 30 days in.....	642 women.
Every 8 to 21 days in.....	169 women.
Every 35 to 56 days in.....	128 women.
And was quite irregular in.....	74 women.

In 500 Jewish women, *Hirsch* found that menstruation occurred:

23 days after the beginning of the last menstruation in.....	19
24 days after the beginning of the last menstruation in.....	29
25 days after the beginning of the last menstruation in.....	36
26 days after the beginning of the last menstruation in.....	56
27 days after the beginning of the last menstruation in.....	62
28 days after the beginning of the last menstruation in.....	73

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and in the remaining cases at other intervals than those stated. He is, therefore, of opinion that in the majority of Jewish women the type of menstruation is shorter than twenty-nine days.

According to *Brierre de Boismont*, among 100 women menstruation recurred:

Every 4 weeks in.....	61 women.
Every 3 weeks in.....	28 women.
Every 2 weeks in.....	1 woman.
And at various irregular periods in.....	10 women.

Tilt found among 100 women that menstruation recurred:

Every 4 weeks in.....	77 women.
Every 3 weeks in.....	17 women.
Every 2 weeks in.....	1 woman.
Every 6 weeks in.....	5 women.

Foster instituted inquiries regarding this matter in 56 healthy women. In 380 periods, 45 recurred after an interval of 28 days, 225 after a shorter interval than this, 110 after a longer interval. The duration of the flow varied from 1 to 14 days; most commonly it lasted from 3 to 5 days.

A peculiar change in the type of menstruation sometimes manifests itself in this way, that in women in whom the regular four-weekly type of menstruation has prevailed, exactly in the middle of this four-weekly period the menstrual molimina, with or without menstrual discharge, make their appearance; the patient suffers from pain in the lower belly, sacache, sensation of weight, and bearing-down pains. *Courty*, *Dubois*, and *Pajot Négrier* have described such cases of *molimen utérin intermenstruel*, which *Tilt* denotes by the term *remittent menstruation*.

From the earliest times the process of menstruation has attracted the attention of natural philosophers, and has led them to formulate hypotheses and to institute investigations, especially in order to ascertain whether the connection between ovulation and menstruation is one of temporal succession merely, or whether the relation is a causal one.

From *Hippocrates* and *Galen* downwards until well beyond the middle ages, the view of the father of medicine was generally ac-

cepted, that menstruation is a purificatory process by means of which materials harmful to the organism are eliminated from the body — a view which finds expression also in the religious and legal ordinances of all times.

A new epoch of scientific research into the nature of menstruation began with *de Graaf's* discovery of the ovarian follicles (1672). This discovery did not, indeed, bring ovulation and menstruation into immediate relationship, but it certainly paved the way for the opinion expressed by *Sintemma*, a countryman of *de Graaf*, that the ova, even in virgins, leave the ovary spontaneously, and by their contact with the capillary terminations of the blood-vessels give rise to the menstrual bleeding (1728).

As a result of anatomical investigations, *Négrier*, in 1840, was the first to establish the thesis that in women suffering from congenital absence of the ovaries, menstruation never occurs; that after the loss of the ovaries, menstruation always ceases; that during pregnancy and lactation and during the climacteric period, ovulation ceases; and that a relation of temporal succession obtains between ovulation and menstruation. This close relation between the two processes was maintained also by *Gendrin* at about the same date. Later, *Girdwood*, by post-mortem research, proved that the number of scars in the ovary coincides with the number of previous menstruations.

Brierre de Boismont, in his exhaustive work on *Menstruation*, lays stress on the view that the periodically recurring ovulation furnishes the impulse for the menstrual flow. First among German investigators, *Bischoff* upheld the opinion that maturation and discharge of ova are spontaneous processes occurring independently of sexual intercourse, and compared heat or rut in other animals to menstruation in women — a view shared by *Pouchet* and *Coste*. Ovulation occurs simultaneously with the menstrual flow, and the follicles burst toward the end of menstruation.

Pflüger, in his important work on the significance and cause of menstruation, has demonstrated the causal connection between menstruation and ovulation. The bleeding and the discharge of the ova are according to him joint effects of a common cause. It is not the bursting of the follicle, but the ripening of the follicle, that gives rise to the menstrual congestion. The pressure of the growing follicle on the surrounding ovarian tissue gives rise to a continued stimulation of the ovarian nerves; the summation of these stimuli, which after the lapse of a certain time attain always a certain degree of intensity, results in a reflex from the spinal cord taking the form of great congestion of the genital organs; this congestion leads, on the one hand, to hæmorrhage from the uterine mucous membrane,

and, on the other hand, and as a rule simultaneously, to the bursting of the ovarian follicle. The swelling and granulation of the uterine mucous membrane at every menstrual period signifies nothing else than the commencement of the formation of the decidua.

Nägele already mentioned the view, that inasmuch as immediately after the first appearance of menstruation a woman has become capable of reproducing the species, each process of menstruation must be regarded as a renewal of the exhausted faculty for conception.

Pflüger's teaching has been opposed by *Sigismund*, who, whilst admitting the periodicity of ovulation and menstruation, yet regards the two processes, in the uterus the formation of the menstrual decidua, in the ovary the rupture of the graafian follicle, as independent of one another, even though they occur simultaneously. Should fertilization occur, the ovum implants itself in the prepared soil; should fertilization fail to occur, the menstrual hæmorrhage ensues. Thus, the occurrence of menstruation indicates that fertilization of the ovum has failed to occur. On this theory, then, the ovum that is fertilized belongs to the first period missed, whereas *Pflüger* assumes that when pregnancy occurs, it is always the ovum belonging to the time of the previous menstruation — the last actual menstrual discharge — that is fertilized.

Löwenhardt, in his work on the *Diagnosis and Duration of Pregnancy*, advances the same views as *Sigismund*. The fertilized ovum, in his opinion also, is that of the first period missed; and since at the time at which he believes fertilization to occur the ovum is certainly still in the ovary, fertilization, on this theory, must always take place in the ovary itself, and the fertilized ovum cannot begin its intra-uterine life till a month has elapsed after fertilization. *Reichert*, *Kundrat*, *Engelmann*, and *Williams*, basing their views on anatomical data, are of opinion that ovulation recurs periodically, and that the extrusion of the ovum occurs not before but after the commencement of menstruation.

According to *Hensen*, the observed facts support the view that the follicles burst as a rule toward the end of menstruation; anticipation or postponement of the opening of the follicle (conception before or after menstruation) would, however, appear not to be impossible.

Leopold, who assumes that menstruation may occur without ovulation and ovulation without menstruation, maintains on anatomical grounds that the rupture of the graafian follicle occurs chiefly during menstruation, under the influence of the swelling due to menstrual congestion. Menstruation with ovulation he believes to be a common occurrence, menstruation without ovulation, an un-

usual occurrence. Further, it is certain that, at the time when the periodic bleeding is due, ovulation may occur, even though the menstrual discharge fails to make its appearance (ovulation without menstruation).

Chazan and *Gläveke* also adhere to the generally accepted view that ovulation is a periodic process, usually but not necessarily synchronous with menstruation.

Strassman bases on clinical facts and on experiments the following view of the connection between ovulation and menstruation. The principal processes in the organism of the sexually mature woman run their course in a periodic rhythm resembling an undulatory movement, the acme of which occurs in the antemenstrual period with the aim of preparing for the development of an infantile organism. Whilst an ovum is maturing in the ovary, in the uterus, in dependence upon this maturation, the antemenstrual mucous membrane, fitted for the reception and nutrition of the fertilized ovum, is also undergoing development. At the acme of the undulatory movement, the graafian follicle ruptures and the ovum is liberated, to undergo fertilization in the infundibulum of the Fallopian tube. If fertilization fails to occur, or if for any reason the graafian follicle fails to rupture, then, in consequence of and at the time of the highest intra-ovarian tension, at the time, when the rupture of the follicle usually occurs, the extrusion of blood from the capillaries of the uterine mucous membrane begins. The intermediation between the ovary and the uterus is probably effected by means of the sympathetic ganglion in the ovary discovered by *Elizabeth Winterhalter*, and effected in this manner, that the stimulus proceeding from the ripening follicle passes along the nerve-fibrils surrounding the follicle to the processes of the nerve cells of this sympathetic ganglion, accumulating in these cells till a certain degree of intensity has been reached, and then, by means of other processes and of the vasomotor nerves, influencing the vessels of the uterus.

Gebhard likewise believes menstruation to be dependent on the ovarian function, and thinks that it is probably brought about in a reflex manner by the gradual growth of the ovarian follicles. It appears that most commonly at the time of menstruation a graafian follicle ripe to bursting is to be found in the ovary, but to this rule there are many exceptions. We cannot exclude the possibility, that the ovum from a follicle that burst after the commencement of the menstrual flow may be fertilized; but more commonly the ovum that is fertilized is that of the first period missed. The sudden decline in vital energy that occurs just before menstruation is explained by *Gebhard* as a kind of atavism, dependent on the fact

that many of the lower animals, butterflies, for instance, succumb as soon as they have fulfilled their duty of reproducing the species.

A number of modern investigators, however, deny that any relation, temporal or causal, exists between ovulation and menstruation, and affirm that the latter process is quite independent of the former.

Thus, *Christopher Martin* maintains that a 'special menstrual centre exists in the lumbar portion of the spinal cord, the impulses from which proceed to the uterus by way of the splanchnic plexus, the ovarian plexus, or perhaps by both. Similar views are held by *Lawson Tait*, *Collins*, and *Johnstone*, who severally maintain that the ovaries are no more concerned in the production of menstruation than any other organ of the body—the liver, for instance. They direct attention to the periodicity that occurs in the functional activity of various other organs, in respiratory and cardiac activity, for instance, both of which undergo rhythmical changes as a result of nervous influences. The cessation of menstruation after oöphorectomy they attribute, not to the cessation of ovulation, but to the division of the nerves which run across the broad ligaments of the uterus and upon which menstruation depends. Heat and rut in animals have a different significance from menstruation. The latter process is induced by civilization and by the adoption of the upright posture.

But, taking all this into consideration, we must hold fast to the fundamental principles, that ovulation occurs at that period of life, and only at that period, during which menstruation proceeds regularly; that ovulation begins when externally and in the whole development of the girl the signs of sexual maturity manifest themselves; and that ovulation ceases at the climacteric, when menstruation also ceases. We must regard as rare exceptions to this rule cases in which ovulation begins before the menarche and persists after the menopause.

A physiological interruption of menstruation occurs during pregnancy and lactation; it seems improbable, however, that during this interval ovulation also is in abeyance. It is established by anatomical investigations that ovulation and menstruation commonly occur in association; but that menstruation sometimes, though rarely, occurs in the absence of ovulation; and, finally, that intermenstrual ovulation is also a rare occurrence. In the majority of cases, either just before or just after the commencement of the menstrual flow, rupture of a graafian follicle occurs. After complete oöphorectomy, menstruation ceases; it is only when functionally active portions of ovarian tissue have been left behind, that menstruation continues to occur. In the absence of the ovaries, the menstrual function is

in abeyance; hence, for the performance of that function, the presence of ripening ovarian follicles and of other follicles capable of ripening later, is an indispensable requisite.

A certain analogy between heat and rut in animals and menstruation in women may, according to the investigations of *Bischoff*, *Hegar*, *Strassmann*, and others, certainly be maintained. Heat or rut is a process occurring in mammals, dependent on the reproductive glands, characterized by an increase in sexual and general excitability, with congestion of the pudendum and the vagina, swelling of the sebaceous glands of the external genitals, and increased secretion; from the vulval cleft there flows a peculiar, strong-smelling mucus, often tinted red from admixture with blood; there is frequent micturition, the uterine glands are swollen, the Fallopian tubes are also swollen, and are soft and erected. A well-developed menstrual bleeding, analogous to that which occurs in the human species, occurs, among the lower animals, only in apes. Maturation of ova precedes the period of heat, and rupture of the graafian follicle occurs during that period.

Heat or rut occurs in animals at certain seasons of the year, which may, according to the species and the mode of life of the animal concerned, be in spring, summer, autumn, or winter. The season of heat or rut has further several periods of heat, each lasting several days, and among domesticated animals, mares, cows, and bitches, succeeding one another at intervals of three or four weeks; in wild animals, rut occurs once only in the year. In animals, sexual intercourse takes place during the time of the menstrual discharge, and during this time also the capacity for conception is increased; in the absence of heat, the genital organs are in a more quiescent condition. In this connection, the experiments on animals made by *Strassmann*, with a view to determining the influence upon the uterus of rise of pressure in the ovary, are of great interest; these experiments showed that a rise of intra-ovarian pressure, produced by the injection of fluid into the parenchyma of the ovary, led to changes in the endometrium and the external genital organs corresponding to those occurring in an animal on heat.

In the human species, however, in contradistinction to what occurs in the lower animals, there is a certain disinclination, on the part of the male at any rate, to sexual intercourse during menstruation. The human female moreover, notwithstanding the periodicity of her sexual life, is at all times capable of conception; this capability is not confined to any particular part of the intermenstrual period, for conception may occur at any time during that period, and has even been known to result from intercourse during menstruation.

This peculiar characteristic of the human reproductive capacity has been regarded as compensatory, furnished by nature in her continual endeavour for the perpetuation of the species, to counteract the restricting influences imposed by civilization on the normal process of reproduction.

Credible observations even exist, indicating that among many primitive peoples, in whom at the time of puberty no social laws hinder the limitless exercise of the reproductive functions, this capacity on the part of woman to conceive at any time has no existence, and that the reproductive capacity of such human beings is, like that of the lower animals, confined to a certain season of the year. Thus, *G. Schlesinger* reports of the Ainus of the island of Yezo, "A friend of mine in Sapporo believes himself to have observed that the Ainus have a certain definite rutting period, and that in them, as in many of the lower animals, the process of reproducing the species occurs only at a certain season of the year." An identical statement is current concerning the Indians of Western America.

The mucous membrane of the uterus undergoes during menstruation important changes, and a question much disputed is, whether in the course of menstruation the whole of the uterine mucous membrane is removed, or a part only, whether it is shed in its entire thickness, or is at least deprived of its epithelium. According to the observations made by *Leopold* on dead bodies, the mucous membrane of the uterus becomes swollen shortly before the commencement of the menstrual discharge, until, partly in consequence of cellular proliferation, partly in consequence of œdematous infiltration, and partly in consequence of enlargement of the lymph-spaces, it attains a thickness of 6 to 7 millimetres ($\frac{1}{4}$ of an inch). The superficial capillaries are notably enlarged, and an effusion of blood-elements continues for several days, without the occurrence of any fatty degeneration in the tissues. The epithelium and the most superficial cell-layers of the mucous membrane are, however, undermined and shed. No complete destruction of the mucous membrane occurs, however, and fatty degeneration forms no part of the menstrual process as such.

Möricke, who examined portions of the uterine mucous membrane removed with the curette during menstruation from living women, found the superficial layers of the mucous membrane to be intact, and he regards the shedding of the epithelium described by other authorities as cadaveric phenomenon. *Sinétý*, who also found the uterine mucous membrane intact during menstruation, adheres to the same view.

Von Kahlen concludes, as a result of investigations made post-

mortem, that during menstruation the greater part of the mucous membrane, not the superficial epithelium only, but the stroma itself down to its deepest layers, is shed. According to *von Tassenbroek* and *Mendes le Leon*, however, the most superficial layers only are shed during menstruation.

According to *Westphalen*, whose investigations were made, partly on masses removed by the curette, and partly on freshly extirpated uteri, a sanguineo-serous infiltration of the mucous membrane begins about ten days before menstruation. Great vascular dilatation occurs only just before menstruation. The uterine glands undergo enlargement, and during and immediately after the flow, numerous shed epithelium cells occupy the lumen of the glands. For the rest, however, in the interior of the uterus shortly after menstruation, we find an almost continuous epithelial covering. Some days after menstruation, the proper regeneration of the mucous membrane occurs.

Mandl, who examined totally extirpated uteri, asserts that during menstruation the epithelial covering of the mucous membrane is never completely lost, but that just as little does it remain completely intact. The regeneration of the lost areas of epithelium proceeds even during menstruation.

The researches of *Kundrat* and *Engelmann* on uteri obtained post-mortem led these authors to describe as follows the anatomical changes that occur in the uterine mucous membrane at the time of the catamenial hæmorrhage. In the premenstrual epoch a round-cell infiltration occurs in the interglandular tissue, the lumina of the uterine glands become enlarged, and the blood-vessels dilated; subsequently, fatty degeneration of the superficial epithelium and the epithelium of the glands occurs, leading to laceration of the vessels and destruction of the affected area of tissue; after the cessation of the bleeding, regeneration of the mucous membrane occurs.

According to *Gebhard*, three stages may be distinguished. The first stage is that of premenstrual congestion, or stage of engorgement: the capillary vessels of the mucous membrane become distended with blood, the membrane itself becomes softened, the meshes of the stroma become enlarged and are filled with the morphological constituents of the blood, subepithelial hæmatomata are formed. The second stage is that in which the blood finds its way to the exterior: owing to the turgescence of the mucous membrane the blood is able to exude between the cells of the intact epithelium; further, the epithelium becomes lacerated in various places where hæmatomata have formed beneath it, allowing the blood to exude through the apertures thus formed; shreds of epithelium may be washed

away by the blood-stream. The third stage is that of post-menstrual regeneration: the swelling of the mucous membrane disappears, the detached areas of epithelium readhere, the blood effused into the interstices of the tissue is reabsorbed, or is in part transformed into yellowish-brown flakes of pigment. According to *Gebhard's* view, during menstruation destruction of the uterine mucous membrane does not occur. At no time is the membrane denuded of large areas of epithelium; a very active process of regeneration occurs, however, in the superficial epithelium and the epithelium of the glands, which fits the uterine mucosa for the reception of the fertilized ovum by keeping it in an ever-young and renovated condition. The mucous membrane of the cervix takes part in menstruation at most by an increased secretion of mucus.

According to *Landau* and *Rheinstein*, the mucous membrane of the Fallopian tubes contributes to the menstrual hæmorrhage; *Fritsch* and *Strassmann*, however, are opposed to the view that there is a regular tubal menstruation.

Pathology of Menstruation.

Only a small proportion of girls and women are entirely free, at the time of menstruation, from all change both in their bodily and in their mental state. A very great majority complain of feeling more or less unwell, of sensations of weight and pressure in the hypogastric region, of a general feeling of languor, loss of appetite, headache, irritability, sometimes of an inclination to weep; in women, a change in the intensity of the sexual impulse manifests itself, an increase in some, a decrease in others.

Not infrequently during menstruation, the cardiac activity is notably affected, so that, regularly at the commencement of each period, disagreeable sensations occur in the cardiac region, with increased frequency of the heart's action; or complaint is made of coldness and dampness of the hands, of icy coldness of the feet, which feel as if "dead" to half way up the calves, and cannot be warmed—phenomena which, in the cases under consideration, occur only at the time of menstruation, and are to be regarded as manifestations of the menstrual reflex.

I examined 140 women in whom the heart and the vascular system were normal, during a number of successive menstrual periods, and in 12 of these women, either at the commencement or during the course of the flow, I observed an increase in the frequency of the heart to the extent of from 12 to 28 beats per minute; in young girls, a systolic murmur was sometimes audible during menstruation, but was inaudible in the intermenstrual intervals. In all these persons, menstruation was regular; there was no abnormality in re-

spect either of the duration or of the quantity of the flow. The heart in these cases was, therefore, affected by the normal menstrual process.

A remarkable illustration of the alleged influence of menstrual disturbances on the pulse is reported by *de Villeneuve*, who states that Chinese physicians, being accustomed to feel the pulse in many different arteries, are able, by a comparison of the characters of the pulse in the two arms, to determine whether a woman menstruates regularly or irregularly.

Many women and girls show well-marked menstrual molimina, uneasy or actually painful local sensations in the genital organs, sacache, painful uterine contractions, and disturbances of the general constitutional state, which are dependent upon menstrual congestion of the pelvic organs, upon local engorgement; sometimes such symptoms are the result of uterine contractions caused by hyperæmia of the uterus, and these cases often take a paroxysmal form.

Important disturbances of the general constitutional state result from sudden suppression of the normal menstrual flow, such as may be the effect of a severe chill, of sudden mental impressions, even of errors in diet or the use of certain drugs, and may sometimes follow artificial withdrawal of blood.

In many women, a few days or it may be a few hours only before every menstruation, changing manifestations of manifold disorders may recur. Among these may be mentioned, general excitement of the nervous system, notable alteration in the voice, strong inclination to sadness, tearfulness, erotic longings, great irritability and sensitiveness of the sensory system, drowsiness, flushings of the face, giddiness, swooning. The appetite is impaired, the breath has a disagreeable smell, the digestion is disturbed, there is a tendency to diarrhœa; the facial aspect may be altered, there are blue rings round the eyes, eruptions on the skin, tendency to sweating, palpitation and feeling of anxiety, and a sensation in the extremities as if they had been beaten. Local symptoms also occur: disturbances of the function of micturition, swelling of the breasts, pains and colics in the renal region, feeling of warmth in the genital organs, pruritus vulvæ, sensation of weight in the uterus, and a strong impulse toward coition. The secretions may be pathological, sometimes there are profuse sweats, sometimes profuse mucous or bilious diarrhœa, whilst the urine may either be very abundant, almost colorless, and nearly free from saline matter, or thick and overladen with phosphates and urates.

Schauta writes regarding the complex of menstrual phenomena which occur in normal menstruation: "In the process of men-

struation, blood and sanguineous mucus find their way through a mucous canal, the normal calibre of which is merely a capillary fissure. If the flow is slow, without the formation of coagula, and if the passage through the cervix is free, very gentle contractions of the uterine muscle suffice on the whole, as the blood exudes into the cavity of the uterus, to expel it into the vagina. Without such contractions, menstruation is hardly conceivable. Physiologically, they are characterized by a bearing-down sensation, passing down toward the thighs, and by pains in the back. It is rarely, that no pain at all is experienced; there are some women, however, who affirm that in their case menstruation begins quite unexpectedly, and without the slightest warning; but it does not follow that contractions of the uterus do not occur in these women also during menstruation. * * * The local disturbances which occur as an accompaniment even of physiological menstruation are, a sensation of fulness and weight in the pelvis, and pains in the lower part of the back, and these probably all result from the uterine contractions. The general disturbances of a reflex nature consist of tenderness on pressure in the epigastrium, headaches, general sense of languor, irritability, and an inclination to shed tears. Among changes in the functions of remote organs may be mentioned, swelling of the breasts, of the vocal cords, and of the thyroid body, increased respiratory capacity shortly before menstruation followed by rapid decrease during the flow, tendency to diarrhœa, nausea, vomiting, flatulence, salivation, profuse secretion of the sebaceous glands of the vulva, increased secretion of sweat, tendency to the formation of acne pustules. The mental condition also exhibits as a rule a considerable change during menstruation, even in cases which cannot in any sense be regarded as pathological. In many instances, an apparently normal woman may during menstruation exhibit a mental state so abnormal that we are led to speak of it as a menstrual psychosis. Apart from this, however, it appears that during menstruation the mental life of woman never remains entirely unaffected. Finally, we must mention certain changes in the sense-organs which not infrequently accompany menstruation, such as herpes conjunctivæ, exophthalmos, limitation of the visual field, and swelling of the nasal turbinate bodies."

In the digestive organs, during the menstrual process, changes in the secretions of the glands, nausea, vomiting, and flatulence are not infrequently observed. In one-half of the women concerning whose state during menstruation *Krieger* made inquiries, he found, especially just before and during the discharge, a tendency to diarrhœa, or at least to more copious and more frequent evacuations of the bowels than occurred at other times. On the surface of the tongue,

at the premenstrual epoch, a pronounced exfoliation of the epithelium may occur, so that in some instances the papillæ are entirely exposed.

Not infrequently hyperæmia of the liver appears to be connected with the menstrual process; and by many observers, among whom *Senator* and *Fleischmann* may be mentioned, jaundice, slight or intense, has been seen to occur during menstruation. In a case of long-standing amenorrhœa, *Duncan* noted the appearance of a transient vicarious jaundice, apparently reflex in its origin. In some cases, jaundice precedes menstruation, and disappears as the flow becomes established.

In the respiratory organs also, menstrual changes frequently occur. According to *von Ott*, respiratory capacity attains a maximum shortly before menstruation, and diminishes rather rapidly during the flow; the expiratory power is similarly affected. In the larynx, according to *Bottermund*, great swelling of the posterior wall occurs during menstruation, whereby the closure of the glottis is hindered, and a rapid onset of fatigue ensues in the muscles that perform this action when the woman sings or speaks; the fulness of the voice is also diminished. More or less extensive swelling of the thyroid body⁸² occurs during the menstrual period. According to *Fliess*, in most women, the inferior, sometimes the middle and the inferior nasal turbinate bodies are greatly swollen; sometimes also the tubercula septi are swollen. It is said that the right half of the nose is more frequently and more intensely swollen than the left half. Epistaxis is sometimes observed at the menstrual periods.

In the urinary organs, the influence of the menstrual period is manifested by a change in the urine. According to *Schrader*, the elimination of urea is diminished shortly before menstruation; according to *Laval*, the elimination of uric acid undergoes a sudden diminution on the second day of the flow, followed by an increase on the third day, subsequently rising above the normal level. This change is to be attributed, not to any excitation of the genital organs, but to the loss of blood.

Hebra already drew attention to the connection between diseases of the skin and the physiological and pathological processes occurring in the female genital organs; and emphasized the fact that for the cure of certain eruptions, local treatment of the disorder of the reproductive organs was requisite. He gave four examples of such eruptions: 1, an acute attack of eczema, which disappeared only after the removal of a badly fitting pessary; 2, in a chlorotic girl, two large red spots on the cheeks disappeared when menstruation was established; 3, improvement of a skin-affection when a co-

⁸² See note 26 to p. 107.

existing disorder of the genital organs received appropriate treatment, followed by recrudescence of the skin trouble when the genital disorder became more severe; 4, a case of obstinate seborrhœa, lasting for many years, which disappeared only when the patient became pregnant, for the first time, seven years after her marriage.

Similar cases have been recorded by subsequent observers, and numerous monographs have been published on menstrual skin-eruptions. *Schramm*, for instance, reports the case of a woman in whom at each menstrual period tubercles and papules appeared on the backs of the hands and on the neck; and the same author mentions another case in which during menstruation red papules arranged in rows appeared on the back. *Wilhelm* observed dark blue macules, the size of hazelnuts, which appeared on the thighs shortly before menstruation and disappeared when the flow was over. Of two cases of menstrual disorder of the skin reported by *Stiller*, in one, an itching eruption appeared on the upper and the lower extremities; in the other, small red papules appeared on the dorsum of the hands and feet. Other cases of menstrual skin-eruptions were published by *Joseph*, *Pauli*, *Janovsky*, and *Schwing*. Sometimes at the menstrual periods severe pruritus vulvæ occurs, due, no doubt, to the temporary increase in the secretion of the menstrual passages, and to the more active influence exercised by this secretion on the vulva.

In two cases in which the menstrual flow was in abeyance, *Heitzmann* observed affections of the skin. In one of these, a young woman aged twenty who had not yet begun to menstruate, there appeared every four weeks isolated papules surrounded by a bright red areola, itching so violently that scratching resulted. In the other, macules the size of a lentil, of a light red or dark red color, appeared, and lasted two or three days; when menstruation became regular, fresh crops no longer formed.

Schauta, in a case of chronic oöphoritis, observed the regular recurrence of urticaria at each successive menstrual period. The suffering being very great, the rest at night being greatly disturbed during the periods of eruption, and the patient's general health declining more and more in consequence, extirpation of the ovaries was undertaken, and the operation resulted in a complete cure. *Schauta* further observed that in cases of obstinate skin-affections of unknown causation occurring in persons of the female sex, some disorder of the genital organs was nearly always present; moreover, in many of these cases, as soon as the genital disorder was cured by appropriate measures, the skin-affection disappeared spontaneously and without any further treatment. He had been able to collect twenty-six cases of this nature, in which an indubitable

connection obtained between disease of the skin and disease of the reproductive system. The forms of affection of the genital organs chiefly noticed in this association were, retroflexion and retroversion of the uterus, erosion and ectropium or eversion of the cervix (chronic cervical catarrh), chronic endometritis, oöphoritis, and salpingitis, and finally with especial frequency uterine myomata; the skin-diseases observed were, acne, eczema, disorders of pigmentation, psoriasis, lichen, and urticaria.

During menstruation we observe not infrequently a number of changes in the skin, such as hyperidrosis, acne, seborrhœa, erythema, and the form of dermatitis known as erysipelas of menstruation; sometimes also effusion of blood into the skin as a form of vicarious menstruation, and peculiar forms of cutaneous œdema. In many women during menstruation the secretion of sweat is markedly increased every month; in exceptional cases, menstruation is vicariously replaced by profuse sweating. In association with menstruation we frequently observe excessive secretion of the sebaceous glands, especially of those of the hairy scalp. Often urticaria manifests itself as a recurrent menstrual eruption. In cases of scanty menstruation and of amenorrhœa, discoloration and excessive pigmentation of the skin may occur, sometimes taking the form (as also in pregnancy) of chloasmia uterinum. Sometimes also in these cases the formation of dark rings round the eyes, already seen in slighter degree as an accompaniment of normal menstruation, is excessive.

In the organ of vision, changes associated with menstruation have been recorded by various observers. Hordeolum menstruale (menstrual sty) may recur month after month at the menstrual periods as an exacerbation of a chronic conjunctivitis. Herpes of the ocular or palpebral conjunctive and eczematous affections may be connected with menstruation; also exophthalmos may occur during menstruation in association with swelling of the thyroid body and palpitation of the heart (*H. Cohn*); again, as an accompaniment of normal menstruation, severe papillitis with retinal hæmorrhages may occur (*Heber*). According to the investigations of *Finkelstein*, a limitation of the field of vision may be noticed during menstruation, beginning on the first, second, or third day of the flow, attaining its greatest intensity on the third or fourth day of the flow, and gradually disappearing during the three or four days next ensuing.

The organ of hearing is stated by *Haug* to be affected during menstruation, inasmuch as congestive redness and swelling of the external ear, of the external auditory meatus, and of the skin over the mastoid process, sometimes occurs; occasionally also, periodic neuralgia manifests itself at the menstrual periods.

In the circulatory organs, as already mentioned, normal menstruation quite frequently manifests its influence by the production of disorders of greater or less severity, referable to the stimulus of ovulation. In 8.5 per cent. of the women of whom I have made inquiries with regard to this matter, palpitation of the heart of variable severity occurred during menstruation, and was most frequent and most severe on the first and second days of the flow. Associated with the palpitation in some cases were, vasomotor disturbances, transient feelings of heat, a sense of congestion in the head, and profuse perspiration without apparent cause. The day before the commencement of the flow, the blood-pressure rises considerably, but falls rapidly during the flow. This menstrual rise in blood-pressure is accompanied by a rise in temperature and an increase in metabolic activity. The influence of menstruation on the heart is most powerfully displayed in cases in which for some reason a disturbance occurs of the normal appearance or normal course of menstruation.

Disorders of menstruation likely to give rise to cardiac disorders are, amenorrhœa, menorrhagia, and dysmenorrhœa.

Amenorrhœa is especially apt to induce cardiac disorder in cases in which, in consequence of some sudden impression, such as a fright or a severe chill, menstruation, which began at puberty in normal fashion and subsequently recurred with perfect regularity, has undergone sudden and complete suppression; also in cases in which severe anæmia or obesity has rapidly led to the onset of amenorrhœa. In such cases, attacks of tachycardia sometimes occur, it may be at irregular intervals, or it may be exhibiting a menstrual rhythm, the cardiac affection manifesting itself always a few days before the date at which menstruation ought to begin. In these cases, also, systolic murmurs are not infrequently audible.

In cases in which menstruation is very painful, the dysmenorrhœa may give rise to attacks of colic or to convulsive seizures, whether the dysmenorrhœa is itself due to inadequacy or to complete suppression of the flow, to metritis, to antelexion, to new growths in the uterus, or, finally, to diseases of the ovaries or to pathological disorders of ovulation. Among the various disorders associated with dysmenorrhœa, heart troubles are not infrequent, most often taking the form of reflex neuroses, evoked by the stimulus of the pain in the genital organs; but it has also been asserted that an acute dilatation of the heart occurs in these attacks.

Very threatening cardiac symptoms as an accompaniment of severe dysmenorrhœa have been seen by me especially in the case of two women, one of whom was in the thirties and the other in the forties. The attacks took the form of increased frequency of

the heart's action, with severe cardiac dyspnœa on trifling exertion, sense of suffocation, and intense anxiety. This severe cardiac and respiratory distress was a sequel to the appearance of severe dysmenorrhœa, and was relieved as soon as the course of menstruation became regular and painless; but the cardiac trouble recurred in association with each successive attack of dysmenorrhœa. In one of these two women, the dysmenorrhœa was the result of extreme ante flexion of the uterus; in the other woman, the cause of the dysmenorrhœa was not apparent. I was unable to decide with certainty whether in these cases an acute dilatation of the heart occurred. French authorities, who describe similar cardiac trouble resulting from diseases of the liver and the stomach by the name of *asystolic gastrohépatique* (Potain), give the following explanation of its mode of occurrence. The intra-abdominal plexus of the sympathetic is stimulated, this stimulus is reflected to the lungs, in which organs it gives rise to vaso-constriction, resulting in increased tension in the lesser circulation; in consequence of this the right heart has difficulty in emptying itself, when weak it undergoes dilatation, and a moderate or extreme tricuspid insufficiency ensues. We have to do, then, in these cases, with reflex symptoms, with a reflex arc, the starting point of which is the sensory nerve-terminals in the abdomen, the afferent tract of which is formed by the sympathetic and pneumogastric nerves, and the efferent tract of which passes along the pulmonary sympathetic nerves.

In other cases of dysmenorrhœa we observed signs of cardiac weakness; the pulse was small, very frequent, and barely perceptible, the face became suddenly pale, the hands and feet were cold; complete syncope sometimes occurred.

Menorrhagia sometimes leads to cardiac symptoms, owing to the severity of the anæmia which follows extensive and long-continued loss of blood; sometimes, however, the heart troubles associated with menorrhagia are reflex manifestations, dependent on the disease which has also caused the menorrhagia, endometritis, it may be, new growths, lukæmia, or scurvy. Sometimes here also we observe transient attacks of acute dilatation of the heart.

Nervous disturbances during menstruation, which are so frequent that Emmet regards it as abnormal for a menstruating woman to be entirely free from pain and from uneasy sensations, are divided by Windscheid into two classes, general nervous disorders, and local nervous manifestations. Among general disorders, the commonest is a general bodily incapacity; in women, who in other respects are quite healthy, during menstruation everything will be too great an exertion, and fatigue speedily ensues on the performance of occupations which at other times are under-

taken without the slightest difficulty. Another common nervous disorder is an uneasy sensation in the head, it may be a feeling of weight or pressure, sometimes described as a feeling as if an iron band were compressing the forehead. Slight mental irritation is commonly present also, the woman is capricious, her mental equilibrium is disturbed. Very common also are vasomotor disturbances, transient feelings of heat, a sense of congestion in the head, or an outbreak of perspiration. Among local nervous disturbances, *Windscheid* enumerates, pains in the back (occasionally and erroneously described as spinal irritation), sacache, pains in the lower extremities, which by preference generally take the course of the great sciatic nerves. Pains in the abdomen also frequently accompany menstruation; these may be diffused over the whole abdomen, or may predominate in the two hypochondriac regions. Disorders of the sense-organs sometimes occurring during menstruation are, the flickering of objects before the eyes, photophobia, and tinnitus aurium. The heart may also be affected with palpitation in association with these nervous disturbances; the stomach may exhibit associated disorder in the form of cardialgia, or more frequently in the form of vomiting, this latter being very frequent at the outset of the flow. Less common is profuse diarrhoea, pain in the anus, or spasm of the sphincter ani.

The intensity of such nervous manifestations during menstruation is dependent upon the woman's general state of nutrition, upon the degree of instability of her nervous system, and upon her occupation. Robust and powerful women, regularly employed in the open air, such as the wives and daughters of farmers and agricultural laborers, are much less affected by the nerve-weakening influences of menstruation than the sedentary and anæmic town-dwelling women, whether these latter belong to the higher classes of society and are addicted to nerve-straining enjoyments, or to the class of shop-girls, seamstresses, and factory-women, whose employment is apt to lead to nervous exhaustion.

As regards the forms of neuralgia most apt to accompany menstruation, *Windscheid* mentions trigeminal neuralgia as the commonest, especially affecting the first division of the nerve, and producing localized pains which are to be distinguished from the headaches already mentioned. They are characterized by their intensity and their persistence in spite of anti-neuralgic treatment, and by their spontaneous disappearance as soon as menstruation is over. According to the same author, the relations between hemicrania and the process of menstruation are indisputable; at the very least it must be admitted that menstruation predisposes to an attack of hemicrania.

Cases also occur in which convulsions almost invariably accompany menstruation, convulsions which are to be regarded as symptoms of hysteria.

The extraordinarily powerful influence which the menstrual stimulus exercises on the mind is shown by the frequency with which the slighter psychopathic states occur as an accompaniment even of normal menstruation, these manifestations being sometimes melancholic in type, sometimes maniacal or erotic, and, when of long duration, leading ultimately to pronounced mental disorder. This influence of the menstrual stimulus is yet more potent in cases in which important changes in the course of menstruation have occurred, in cases, for instance, of suppressed, painful, or irregular menstruation. In this connection, however, in order to avoid a confusion of cause and effect, we must carefully bear in mind, that it is a much commoner causal sequence for psychical disorders to disturb the normal course of menstruation, than for disorders of menstruation to evoke psychical disorders. This view has only quite recently become established, and for this reason it is necessary to regard such data when obtained from the writings of the older gynecologists in a somewhat critical spirit.

By the modern alienist, the influence of the menstrual reflex on mental affections is recognized only in cases in which a proper valuation of the predisposing causes has been made, in such cases as the following: First, we have to recognize the modifying influence exercised by the menstrual stimulus on established psychoses, inasmuch as these latter not unfrequently undergo cure when previously irregular menstruation has become regular, and, moreover, the recurrence or the first appearance of menstruation has often a powerful influence on the course of some established mental disorder. In some cases this influence is a strikingly favorable one on psychoses that have developed before the commencement of menstruation, or during the suppression of that function; it may be, however, and, indeed, more frequently is, an unfavorable influence, inasmuch as such a psychosis, on the first appearance or on the reappearance of menstruation, may assume a menstrual type, the attacks becoming more frequent or more violent with the successive recurrence of each menstrual or premenstrual period. This is the history of the typical menstrual psychosis.

Again, certain processes of the sexual life, disorders of menstruation, diseases of the genital organs, operations on these organs, and the processes of the climacteric, influence the origin and the character of mental disorder, generally giving rise to chronic affective insanity (insanity of the emotions and feelings) or to paranoia (chronic delusional insanity, insanity of the intellect). The men-

strual stimulus must in these cases be regarded as a psychopathically exciting physical cause.

Further, physical disturbances may equally affect the menstrual function and the functions of the mind, rendering the exact causal sequence in such cases a difficult one to determine; and, conversely, the circumstances that restore the normal working of the mind may also regulate the menstrual function.

Finally, we may have to do with isolated sporadic occurrences in which the exciting influence of menstrual processes may be traced. Thus, for the outbreak of a periodical menstrual psychosis, an especial temporal predisposition must exist, connected with the great developmental epoch of the sexual life.

There is, for instance, a group of transitory states occurring during menstruation, and taking the form of disorders of the intelligence or of explosive emotional states; such may be witnessed, not in those suffering from psychopathic predisposition, but in quite healthy individuals.

The successive menstruations as they recur regularly throughout the course of the sexual life may, just like the first menstruation, though with diminished intensity, give rise to manifestations of nervous and mental disorders. In many women who are in other respects healthy, we see during menstruation, hemicrania, nervous irritability, ill-temper, low-spiritedness, and even hysterical and epileptic attacks; these occur chiefly on the first and second days of the flow, and disappear altogether toward the end of the period. These manifestations are more severe in individuals weakened by profuse losses of blood or by chronic disorder in various organs, more severe also in those predisposed to such disturbances in consequence of neuropathic inheritance, more severe in women suffering from menorrhagia and dysmenorrhœa, and from any kind of mental stress.

In his work on the influence of the so-called menstrual wave on the course of mental disorders, *Schüle* remarks that the mental equilibrium even of a perfectly healthy woman is not a stable one, but is subject to a series of oscillations. "The menstrual period," he continues, "has a distinct influence on woman's mental equilibrium. Even in those whose nervous system is a healthy one, menstruation evokes a state, now of depression, now of excitement; in neurotic women, on the other hand, menstruation may give rise to nervous diseases which may equally exhibit the characteristics of depression or the characteristics of excitement. In nervously predisposed women, the influence of regularly established menstruation, even when the circumstances are favorable, is pretty much the same as the influence of menstruation when it first makes its ap-

pearance; the influence is merely somewhat weaker in so far as the woman has learned to endure and to be patient. The menstrual state, in nervously predisposed women, evokes the particular neurosis to which the individual happens to be liable. The disorders most commonly met with in this association are, hysteria, hemicrania, swimming in the head, epileptic paroxysms, toothache, and neurasthenia."

Especially frequent during menstruation is hemicrania. Sometimes hemicrania may begin a day or two before menstruation, as a prodromal sign, and may accompany its whole course, becoming, however, less severe toward the end of the flow. Hysteria most commonly manifests itself in association with menstruation by a depressed emotional state, by tearfulness, by complaints made without sufficient grounds, by globus hystericus or clavus hystericus; sometimes also by paroxysms of muscular spasm; very rarely by hysterо-epileptic seizures. Epilepsy may occur either by day or by night. Nocturnal seizures usually occur without any apparent external cause, as a result of the central stimulus; diurnal attacks, on the other hand, have usually some external exciting cause. Often, however, years may elapse without any attack of major epilepsy occurring, the disease manifesting itself in one or more of the many varieties of the minor form (*petit mal*), as transient absences of mind, attacks of vertigo, etc.

The nervous disturbance in a menstruating woman may be so great as to lead to the production of psychoses. The question of the existence of a menstrual insanity *sui generis* has been answered by many alienists in the affirmative; by others, however, who see in the alleged cases nothing specific, it has been answered in the negative. The relation of menstruation to the mental disorder may be a double one: 1, menstruation may occur repeatedly in the course of an already established mental disorder; 2, menstruation and its morbid variations may favor the occurrence of psychoses that exist already in a latent form, and may lead to the origination of psychoses to which the organism is predisposed.

In the former connection, *Brierre de Boismont* undertook an investigation which showed that in women suffering from mental disorder, an exacerbation of that disorder was to be observed during menstruation. *Schlager*, who regards the menstrual process as possessing when anomalous a high significance for the development and course of mental disturbances, observed that in 33 per cent. of women suffering from mental disorder, the menstrual state had an unfavorable influence upon the course of that disorder, inasmuch as it led to an increased irritability; in the rest of the cases, however, menstruation was without influence upon the course

of the ordinary chronic psychoses. In the cases that were unfavorably influenced, epileptic attacks usually became more frequent, and chronic melancholia became much more profound. *Schröder* observed in chronic forms of melancholia that during menstruation the sadness became intolerable and was associated with a suicidal tendency; in chronic maniacal forms of mental disorder, the excitement underwent an increase during menstruation. *Von Krafft-Ebing*, as a result of his investigations into insanity during menstruation, came to similar conclusions with regard to the unfavorable influence of the menstrual process. *Algeri* likewise states that menstruation notably aggravates the cerebral symptoms in the course of mental disorders.

Other authors, *Marcé* and *Kowalewski* for instance, whilst emphasizing the powerful influence exerted by menstruation on any existing psychosis, point out that in some instances, as in states of mental and physical depression, this influence is for the worse; but in other instances, especially in states of maniacal excitement, the condition of the patient undergoes notable amelioration during menstruation. *Schäfer* also, in his researches into the relations between the processes of menstruation and psychoses, discovered that anomalies in the course of menstruation ran almost parallel with anomalies in the course of mental activity.

In psychopathically predisposed women, disorders of menstruation, such as amenorrhœa, delayed menstruation, and dysmenorrhœa, are more effective than the normal process of menstruation in evoking manifestations of psychical abnormalities previously latent, and in leading to attacks of precordial anxiety, pathological emotional states, melancholic seizures, epilepsy in all its varieties, and impulsive manifestations, such as pyromania, kleptomania, infanticide, homicide, etc. As results of a special predisposition may appear in this connection, congenital imbecility, idiocy, melancholia, and chronic weak-mindedness.

A rich literature exists of cases in which mental abnormalities occurred in psychopathically predisposed individuals as a result of menstruation. Thus, *von Krafft-Ebing* reports a case in which, during menstruation, a mentally undeveloped woman murdered her husband; and another case in which to chronic weak-mindedness and chronic delusional insanity were superadded during menstruation peculiar attacks having the character of psychical storms. *Tuke* reports a case in which a mother, in a state of alcoholic excess during menstruation, murdered her daughter. *Pelmann* records acts of pyromania committed during menstruation by a girl seventeen years of age. *Mabille* records a case in which a woman suffering from severe mental disorder was affected during menstruation by

impulsive kleptomania, whilst after the periods the memory of what had happened passed away. *Philo-Indicus* records the case of a woman suffering from severe neuropathy who at the menstrual periods exhibited great irritability, experienced marked sexual excitement, and had suicidal impulses, and who on one occasion attempted to murder a female friend who had refused to assist her in the practice of sexual aberrations. *Giraud* describes a woman suffering from passive melancholia, in whom during menstruation horrible fantastic ideas occurred. *Ball* records the case of a woman who suffered always from acute mental disorder during menstruation, and who, in one of these attacks, murdered her son. *Kowalewski* reports a case of chronic imbecility, in which during menstruation attacks of precordial anxiety developed, and in the course of one of these attacks the patient set fire to her own house. "In such cases," remarks *Kowalewski*, "menstruation represents the last drop that makes the full goblet overflow."

In addition, we meet with cases in which the influence of menstruation is so powerful that it must be regarded as the principal cause of the psychosis. We must then speak of a true menstrual psychosis, the impulse to which is supplied by the normal or abnormal changes occurring in the process of menstruation, and characterized by the menstrual periodicity and the brief duration of the attacks. These are the characteristics of the menstrual psychoses of the menarche and of the climacteric period; and such cases occur also during the period of full menstrual activity.

The menstrual psychosis most commonly makes its appearance shortly before the flow, becomes less severe with the establishment of the flow, and disappears when the flow ceases; in other cases, the psychosis appears toward the end of menstruation, and speedily passes away; or, again, in amenorrhœic cases, the attacks of mental disorder replace the proper menstrual flow, and become less severe or disappear entirely as soon as the flow is regularly re-established. The commonest forms of these menstrual psychoses are, melancholia, mania, irresistible impulses, acute amentia, in rare cases alternating insanity (*folie circulaire*) in which the periods of alternation assume the menstrual rhythm. The duration of these psychoses is usually short, from a few days up to a fortnight; there may be only a single attack, or there may be a number of attacks presenting precisely similar characters.

The consciousness may be more or less disturbed. *Von Krafft-Ebing* points out, as a very dangerous peculiarity of the menstrual psychoses, that the fact that the morbid process has once occurred in connection with menstruation furnishes in itself a sufficient reason for the recurrence of such attacks, which are dependent on

constantly repeated functional changes in the brain closely analogous to those that occur in epilepsy. When the menstrual insanity recurs frequently, it gradually becomes less acute in its characters and more protracted in its course; the lucid intervals are less clearly indicated and shorter in duration; and thus in course of time the mental disorder may be transformed into chronic imbecility — a transformation liable to occur in all forms of periodic psychosis. In such cases we must always assume the existence of a certain lack of resisting power on the part of the organism, especially of the nervous system, which amounts to a congenital predisposition. During the period of full menstrual activity, the favorable soil for the cultivation of such disorders is usually furnished by anomalies of menstruation, by difficult labor and its consequences, severe losses of blood, prolonged lactation, physical overexertion, and mental shock and stress.

In the development under the influence of menstruation of such periodic acute mental disorders, we may observe various gradations, as for instance short, syncope-like cataleptic seizures, states of hallucinatory confusion lasting several hours or several days, disordered consciousness, and even severe mania.

Such a case was observed by *Wille*. Under the influence of menstruation and of a trifling source of mental disturbance (having soldiers billeted on them in a quiet country village), a young woman aged twenty-one, whose mental health had previously been good, had a sudden attack of anxiety, succeeded by a violent but transitory mania, lasting five or six hours; after a short free interval came another attack, this time lasting several days. Similar cases were recorded by *Friedmann*. A blooming and healthy maid-servant eighteen years of age (some mental unsoundness was recorded in both grandfather and aunt on the maternal side) fell asleep in a chair a few days before menstruation, awakened with a start, was subsequently disordered in mind, though tranquil, with many hallucinations, listening to voices which repeated monotonously "they come," was drowsy, and slow to answer when spoken to. On the third day she was recovered, her mind being clear and normal; she was not fully aware of what had happened. Since this attack, her mind has been free from disorder, during menstruation as well as at other times. She is said to have had a similar attack about four years ago, that is, at the commencement of puberty.—A girl aged thirteen, quite healthy, not nervous, physically rather powerful, with quite healthy family history. Complaints of having suffered for two days from general sense of depression with pains in the abdomen; during the afternoon was lying on a sofa, but suddenly sprang up, looked extremely anxious and confused, ran

about the room, begged to be protected from the black man, etc., her speech was disconnected, gabbling, and difficult to understand. After two hours she became quiet, and fell into a sound sleep, from which she awoke calm and quite forgetful of what had passed. On the following day menstruation appeared for the first time, with abdominal pains, but without any mental abnormality. During the subsequent six years she has remained quite well.

Since the days of antiquity an extremely important part has been assigned to suppression of the menses in the production of mental disorders; but in the opinion of modern alienists, who are opposed to the old humoral pathology, no more is to be recognized in this connection than the ordinary menstrual stimulus, which, indeed, when the soil is already prepared, may furnish a causal determinant for an increase in the intensity of an already existing anomalous mental condition. Quite recently numerous cases have been published in which such an influence has been recognized as powerful. *Von Krafft-Ebing* writes: "In isolated cases, as a sequel of sudden cessation of the menstrual flow, generally, due to a fright or to a chill, the development of insanity (usually acute mania) has been observed, and the suppression of menstruation has been regarded as the causal determinant. It is indeed conceivable that the connection between the two events is supplied by a collateral vicarious congestion of the brain. As a rule, however, the psychosis and the suppression of menstruation are the coeffects of the same cause, and are both of vasomotor origin."

Mairct reports a case of violent mental disorder of a maniacal type, associated with chorea, occurring at puberty, the exciting cause of which, in a constitution hereditarily predisposed to insanity, he believed to be suppression of the menses. *Diamant* had under observation a girl in whom, at the age of six years, menstruation ceased, having previously been regular since the age of two years; after the suppression of menstruation, violent epileptiform seizures set in, occurring at what should have been the menstrual periods. *Westphal* described a case of infanticide committed in a state of melancholia at the proper menstrual period, the menses being suppressed.

Menstrual psychoses are observed for the most part in comparatively young women; after the age of thirty-five they are uncommon. Among *von Krafft-Ebing's* cases there were:

4 patients between the ages of.....	15 and 20 years.
6 patients between the ages of.....	20 and 25 years.
2 patients between the ages of.....	25 and 30 years.
6 patients between the ages of.....	30 and 35 years.
2 patients above the age of.....	35 years.

The same author insists that for the development of a menstrual psychosis a predisposition on the part of the brain must exist, either

in the form of an inherited predisposition, or in the form of a primary mental disorder, or, finally, as the result of some special exciting cause, such as emotional disturbance, the abuse of alcohol, or bodily illness. Among 19 cases observed by *von Krafft-Ebing*

12 were hereditarily predisposed.

4 had previously exhibited great nervousness during menstruation.

7 suffered from primary mental weakness.

Very remarkable is the influence, demonstrated especially by *Lombroso*, exercised by menstruation on the commission of certain crimes. Of eighty women taken into custody for resisting the police, there were nine only who were not menstruating at the time. Four notorious murderesses and one woman convicted of arson were all menstruating at the times when their crimes were committed. *Krugenstein* found evidence of menstruation in the bodies of 107 women who committed suicide. Thefts committed by ladies in the great shops of Paris are most commonly effected during menstruation, as was found by *Legrand du Saulle* to be the case in thirty five instances out of fifty-six investigated by him in respect to this matter. According to the same author, hysterical girls who steal articles of clothing, bottles of scent, and the like, from the counters of shops, are almost always menstruating at the time.

Von Krafft-Ebing puts forward the following propositions with regard to the forensic significance of offences committed by women during menstruation: 1. The mental integrity of a menstruating woman is questionable from the forensic standpoint. 2. In the case of women on trial for any offence, the point should be determined whether that offence was committed at a menstrual period. 3. An inquiry into the mental condition is expedient in cases in which such a coincidence is established; light is thrown on the matter when investigation shows the existence of hereditary predisposition, when we learn that psychopathic manifestations have occurred at previous menstrual periods, or when the very nature of the offence is one suggesting the presence of mental disorder. 4. A recognition of the powerful influence which the menstrual process exercises upon the mental life should lead, even in cases in which no menstrual psychosis has been proved to exist, to the admission of extenuating circumstances in apportioning the punishment for the offence. 5. In the case of the commission of a punishable act during menstruation by a weak-minded individual, we must as a rule admit the plea of irresponsibility — at any rate in the case of an offence committed under the influence of strong emotion. 6. Persons who have been discharged without punishment on the plea of mental disorder accompanying menstruation must be regarded as dangerous to the community, and should always be under careful supervision during the menstrual periods.

Amenorrhœa, Menorrhagia, and Dysmenorrhœa.

Amenorrhœa, permanent or transient abnormal lack of the menstrual flow, may depend upon anatomical changes in the genital organs, upon incomplete development or absence of the uterus and the ovaries, upon enduring or transient defective nutrition or upon atrophy of these organs, or upon parenchymatous disease of the ovaries; or it may be due to functional disturbances of ovarian activity, itself dependent upon changes in the nervous system, upon constitutional diseases, or upon general nutritive disturbances in the body. Among the latter conditions must be especially mentioned chlorosis, obesity, diabetes, chronic alcoholism, and morphinism, myxoedema, exophthalmic goitre, etc.

The amenorrhœa that occurs at the time of the menarche has already been described in connection with the symptomatology of that period.

If in cases of amenorrhœa the ovaries continue to perform their functions, we frequently witness severe and painful menstrual molimina, occurring periodically at the times when the flow might be expected, but fails to appear. In cases of atrophy of the uterus and the ovaries, we see complete and permanent amenorrhœa without any discomfort. As a kind of vicarious menstruation, in certain cases of amenorrhœa, we see hæmorrhages into the vitreous body or conjunctival hæmorrhages; also, as more extensive disturbances of the visual organs, interstitial keratitis, disseminated choroiditis, intermittent amaurosis, acute retrobulbar neuritis, amblyopia, and limitation of the field of vision.

Mooren publishes the following cases, showing the influence of amaurosis on the eye. A girl aged fourteen, with severe bilateral pannous keratitis, was amenorrhœic notwithstanding the existence of well-marked menstrual molimina. Every four weeks, at the times when the menstrual flow should have appeared, the corneal inflammation became more severe; it became amenable to treatment for the first time a year later, when the menstrual flow had become established. A peasant woman, twenty-eight years of age, had never menstruated; the uterus was badly developed; every month an intolerable heat and swelling of the face recurred. Since the age of fifteen she had suffered from bilateral interstitial keratitis, which had resisted all treatment, and had been subject every four weeks to a recurrent exacerbation of this trouble, lasting several days. The exhibition of powerful emmenagogues and the use of Friedrichshall water brought about on a few occasions a scanty discharge of blood. The comfort to the patient, relieved as if by miracle from her pain and photophobia, was most remarkable. Unfortunately, however, this state of comparative happiness lasted from twelve to fourteen

weeks only, after which, in spite of everything that was tried, there was no further recurrence of menstruation, and the condition of the eyes relapsed to what had existed for thirteen years. In other cases described by *Mooren* the amenorrhœa was complicated with disseminated choroiditis and with posterior sclero-choroiditis.

Beer reports a case of retrobulbar neuritis occurring with amenorrhœa, consequent on infantile aplasia of the uterus. An interesting case was recorded by *Dunn* of a girl fifteen years of age, who had not yet begun to menstruate, and who suffered from interstitial keratitis, with severe photophobia. The ocular symptoms vanished with extreme rapidity as soon as menstruation first appeared. *Napier* observed complete blindness, without discernible anatomical cause, associated with amenorrhœa of sudden onset; the amaurosis disappeared as soon as menstruation was re-established.

Striking and manifold are the disturbances of the nervous system which may be caused by amenorrhœa, ranging from increased irritability, hyperæsthesia of various nerve tracts, neuralgia, and the like, to severe psychoses.

Barnes reports a case of mental disturbance consequent upon amenorrhœa in a woman twenty-seven years of age, who had begun to menstruate when sixteen years old, and in whom the menses had been suppressed a year earlier when she was informed of the sudden death of her father. From that time a progressively increasing weakness of the mind was observed. In a case recorded by *Macnaughton Jones* the mental depression consequent on amenorrhœa was so great that it led to an attempt at suicide.

Lawrence observed in young girls who from any cause suffered from amenorrhœa, that an increased pigmentation of the skin sometimes occurred, analogous to that met with in *Addison's* disease. This amenorrhœic pigmentation he compares to the chloasma that is seen in pregnant women.

By menorrhagia we understand the occurrence of typical discharges of blood from the uterus, occurring at more or less regular intervals and differing from normal menstruation in respect either of the greater intensity or of the longer duration of the hæmorrhage; whereas by metrorrhagia we understand the occurrence of atypical discharge of blood from the uterus, which is related to menstruation neither in respect to its causation nor in respect to the time of its appearance.

Menorrhagia may be due to local changes in the genital organs, to organic diseases of other organs, and to general diseases.

Local changes which may give rise to menorrhagia are, active hyperæmia and passive hyperæmia (hyperæmia from engorgement) of the genital organs, such hyperæmia being itself due to sexual ex-

citement, especially when ungratified, to violent physical exercise, or to chill during menstruation; menorrhagia is also liable to occur when the abdominal circulation is disturbed by extreme obesity or by the presence of tumors, also in connection with endometritis, uterine myomata, erosions of the cervix, etc. Diseases of organs other than those belonging to the reproductive system which are especially likely to give rise to severe bleeding are, disease of the heart, such as valvular incompetence, lung disease, and nephritis. General diseases in which menorrhagia may occur are, anæmia, chlorosis, hæmophilia, scurvy, scarlatina, cholera, smallpox, influenza, and obesity.

Through severe loss of blood in menorrhagia, whether the bleeding be sudden and profuse or more moderate but long continued, a condition of chronic anæmia results, with all its threatening consequences to the health and the life of the woman affected. She becomes pale and weak, unfitted for any great physical or mental exertion, and is liable to attacks of cardiac enfeeblement and to fainting fits; in some cases degenerative changes ensue in the cardiac muscle.

Dysmenorrhœa is characterized by severe pain occurring before, during, and after menstruation. The pain is caused either by abnormally powerful contractions of the uterus or else by abnormal sensitiveness of that organ. Abnormally powerful contractions are caused by various mechanical hindrances to the normal processes of menstruation; abnormal sensitiveness is due to inflammatory and congestive states of the uterus and its annexa or to a general increase of nervous sensibility.

Schauta, therefore, distinguishes a mechanical, an inflammatory, and a nervous form of dysmenorrhœa. Mechanical dysmenorrhœa is most frequently due to stenosis or flexion of the canal of the cervix in some part of its course from the internal to the external os, dependent upon malformation or flexion of the uterus, hyperplasia of the mucous membrane, chronic metritis, scarring resulting from operative procedures, uterine polypi, etc. In inflammatory dysmenorrhœa we have to do "either with an inflammatory process or with excessive tension of the intrapelvic organs, dependent upon abnormal distension of their blood vessels." To the same category belong ovarian dysmenorrhœa, and dysmenorrhœa due to inflammatory changes in the Fallopian tubes and to pelvic peritonitis. In nervous dysmenorrhœa, no anatomical cause is apparent, but the uterine contractions normally occurring during menstruation, and the normal congestive distension of the intrapelvic organs at that period, become extremely painful, in consequence of a morbid increase in the sensibility of the nervous system.

The influence of dysmenorrhœa on the general condition of the woman suffering from it is often a very potent one.

The normal undulatory course of the bodily temperature—which as *Reinl* has shown, undergoes a gradual rise until shortly before the appearance of the menstrual flow, gradually falls during menstruation, and continues to fall for a time after menstruation is over—undergoes a change in cases of dysmenorrhœa due to antelexion of the uterus, parametritis, or salpingitis, inasmuch as in these cases the acme of the temperature curve is reached actually during menstruation and the decline of temperature comes, not at the commencement of the menstrual flow, but often only after the flow has ceased. The curve of blood pressure and the curve indicating the excretion of urea are similarly affected in these cases.

As symptoms in other organs occurring in cases of dysmenorrhœa *Schauta* mentions “sensations of heat, coldness of the feet, retching and vomiting, cramps of the stomach and of the voluntary muscles, general disorders of nutrition, loss of appetite, strangury, constipation, dyspepsia, headache, and finally hysteria. As symptoms of the latter affection we may notice, anæsthesia, hyperæsthesia of certain parts of the abdomen, attacks of cramp, paralysis, uterine cough, hiccough, spasm of the glottis, epileptiform seizures. The repeated severe attacks of pain may seriously disturb the nervous system, leading to the appearance of general neuroses and psychoses. Frequently we observe, as a peculiar accompaniment of dysmenorrhœa, changes in the fulness of the blood vessels of the face and also in other regions of the skin, in consequence of vascular paralysis. In other cases, actual effusion of blood occurs, and, as a sequel of this, deposits of pigment; and the semicircles beneath the eyes may become so dark as to look as if they had been artificially tinted (*Macnaughton Jones*). In one case, during menstruation periodic swelling of the gums was observed (*Regnier*). Finally, in association with dysmenorrhœa, various forms of neuralgia, changes in refraction, and slight attacks of neuritis and retinitis may occur.”

One of the commonest symptoms and sequelæ is headache, sometimes in the form of hemicrania, which may be associated with dyspeptic manifestations, sometimes diffused over the whole surface of the skull.

Dyspepsia is a very frequent associate of dysmenorrhœa. Thus we meet with pain and tenderness in the gastric region, nausea, vomiting, and also cardialgia. Sometimes the liver becomes enlarged and tender on pressure; in many cases also jaundice is witnessed.

Gebhard refers to another phenomenon which may be classed under the head of dysmenorrhœa, from the character of the pain

that is experienced, even though this pain is not felt at the menstrual periods, but in the intermenstrual epoch. This is the so-called intermediate dysmenorrhœa (intermenstrual pain, Ger. *Mittelschmerz*). In the character of the localized pain, intermediate dysmenorrhœa closely resembles ordinary dysmenorrhœa; it recurs often with precise regularity on certain days during the intermenstrual interval. *Croom* distinguishes three forms of intermediate dysmenorrhœa; that in which there is no discharge at all from the uterus, that in which there is a sanguineous discharge, and that in which there is a clear watery discharge. The first form he attributes to asynchronism in the processes of ovulation and menstruation; the second form, to endometritis with disintegration of the mucous membrane; the third, to a kind of hydrops tubæ profluens (profluent dropsy of the Fallopian tubes—hydrosalpinx in which the fluid accumulates in the tube, and at a certain stage of its accumulation flows into the uterus). Cases of intermediate dysmenorrhœa are somewhat rare, if we eliminate the cases in which pains occur in the intermenstrual epoch in consequence of disease of the uterine annexa. Inflammatory manifestations may be discovered in nearly all typical cases of intermediate dysmenorrhœa.

Long-continued dysmenorrhœa may give rise to numerous hysterical troubles, general convulsive seizures, local muscular spasm and paralysis, hiccough, spasm of the glottis, uterine cough, twitching and spasm of various groups of voluntary muscles. In some cases we see fully developed epileptic convulsions, with complete loss of consciousness and immobility of the pupils. Finally, psychoses may arise in association with dysmenorrhœa.

In cases of pathological changes in menstruation, a carefully arranged hygiene at the menstrual periods is of importance both for prophylactic and for therapeutic purposes, and in this connection I may refer to what I have written in the section on *Hygiene during the Menarche*. In cases of dysmenorrhœa a certain amount of repose and precaution are needed during the flow, with avoidance of chill, scrupulous cleanliness, and regulation of the bowels. In cases of amenorrhœa we must prescribe attention to the general nutrition by means of an easily digested roborant diet, as much fresh air as possible, and systematic bodily exercise. In these cases, bicycling, lawn tennis, and suitable gymnastics are often of value; also baths, in the form of warm general baths, hot sitz baths, and hot foot baths.

Vicarious Menstruation.

In cases in which, in consequence of morbid conditions of the uterus, the ovaries, or the organism as a whole, the menstrual flow has at the time of the menarche either failed entirely to appear or

been exceedingly scanty, hæmorrhages from other organs have since ancient times been witnessed, and these hæmorrhages have been regarded as vicarious menstruation. The congestion that occurs during menstruation is not limited to the genital organs, and when the flow of blood from the uterus fails to occur, the organism seeks another outlet, in order to restore the disturbed equilibrium of blood distribution, and vicarious hæmorrhages take place from the mouth, the nose, the intestines, the anus, the gums, the mammæ, the ears, and the lungs; or hæmorrhages occur in the brain, the nerves, or the eyes.

Although it must be admitted that confusion has often occurred between vicarious menstruation and hæmorrhages dependent on pre-existing genuine organic disease, such as hæmoptysis due to pulmonary tuberculosis, or hæmatemesis due to gastric ulcer, still the existence of a true vicarious menstruation must be regarded as fully established.

Thus, *Fricker, Fleischmann, Obermeier, Beigel, Withrow, Plyette*, and *Parsons* observed vicarious epistaxis; *Watson, Decaisne, Edebohls, Fischel*, and *Seeligmann*, vicarious hæmatemesis; *Franchi, Hotte, Ratgen, Voigt*, and *Windmüller*, vicarious hæmoptysis; *Dunlap*, vicarious gingival hæmorrhage; *Law* and *Petiteau*, vicarious otorrhagia; *Heusinger* and *le Fort*, vicarious hæmorrhages, occurring variously from the anus, bladder, hand, ear, nipple, stomach, and nose; *Baumgarten*, vicarious hæmorrhage from the vocal cords and trachea; *Hahn*, from the bladder; *Kerley*, in the thyroid body; *Gallemairts*, in the eyes. *Puech* found, in the cases he collected, that vicarious menstrual hæmorrhage occurred from the stomach thirty-eight times, from the mammary glands twenty-five times, from the lungs twenty-four times, and from the nasal mucous membrane eighteen times. In all the cases menstruation, had long been in abeyance.

Regarding vicarious epistaxis, especially exact observations have been published, showing the mutual relationship between the genital and the nasal mucous membrane. A series of cases has been recorded by *Fliess*. In one of these a remarkably well-developed girl of fourteen, who complained at three-weekly intervals of molimina, in the form of languor, headache, and sacache, after an interval of four weeks epistaxis occurred instead of the expected menstruation; three weeks later came another attack of epistaxis; and finally, after an interval of seven weeks, came the first menstruation, which henceforward recurred every three weeks. In another case, that of a girl aged fifteen, menstruation appeared once; four weeks later came an attack of epistaxis instead of menstruation, and these attacks of epistaxis were continually repeated, at intervals of twenty-nine days.

in place of menstruation, until finally pregnancy occurred. During pregnancy the epistaxis ceased, to recur however six weeks after parturition; the attacks continued for eight monthly periods, when they ceased finally at the commencement of the second pregnancy.

Other similar cases are known in which epistaxis recurred with all the regularity of the menstruation it replaced *during* pregnancy and ceased at parturition. Analogous cases occur in which epistaxis has persisted during pregnancy, during the puerperium, and at the climacteric period, replacing the physiologically suppressed menstrual flow. Similarly *Liégois* has observed vicarious hæmoptysis during pregnancy. According to *Baumgarten*, in vicarious epistaxis the bleeding almost always proceeds from the region of the cartilaginous septum, and may become very violent; vicarious hæmorrhage from the larynx proceeds from the true and false vocal cords. Tracheal hæmorrhage is a much rarer occurrence.

Analogous to these cases are those in which the vicarious hæmorrhages occur after removal of the ovaries. Thus *Tauffer* in one case saw epistaxis replace menstruation after this operation. *Schmalzfuss* reports a case in which a woman suffering from valvular disease of the heart, was said after oöphorectomy to have had almost daily attacks of hæmoptysis and epistaxis. *Glævecke* found in the post-operative history of forty-four cases of oöphorectomy that two patients suffered from vicarious hæmorrhages. The last-quoted author is of opinion that the suppression of menstruation resulting from oöphorectomy rarely leads to vicarious hæmorrhages, and that even when these do occur they are so inconsiderable in amount as to have no practical significance.

Quain records the case of a woman aged thirty-three, in whom uterus and ovaries were absent, and in whom for two years epistaxis recurred every month with considerable regularity.

In cases in which menstruation is in abeyance, we sometimes witness, instead of vicarious hæmorrhages, the occurrence of non-sanguineous vicarious discharges from various mucous membranes. Thus, vicarious leucorrhœa is seen, especially in chlorotic patients, in whom, from the time of the menarche onward, such a discharge may occur every month, instead of the delayed menstruation. Similarly, vicarious diarrhœa and vicarious salivation have been observed.

THE SEXUAL IMPULSE.

By the term *sexual impulse*, we understand the impulse shared by women and by men towards intimate physical contact and sexual intercourse with individuals of the opposite sex. In the child this impulse slumbers, to awaken at the menarche with the onset of pu-

berty, to increase slowly at first, and then more rapidly, after the manner of an avalanche, until it becomes a powerful passion, dominant throughout the active sexual life of the woman, and it may even continue far beyond this period. The proper aim for whose attainment the sexual impulse in woman strives is by no means (as is asserted in some quarters) the fulfilment of "the impulse toward motherhood," but is merely the complete satisfaction of sensual passion by intercourse with the male. Still, the sexual impulse is often satisfied by the minor degrees of sexual gratification in the form of the mutual contact, so agreeable to the sense of touch, of portions of the body, and even by the play of imagination and illusion under the dominion of love. Finally, also, love amounts to what *Buffon*, the celebrated naturalist, expressed with coarse incisiveness in the phrase, "L'amour c'est le frôlement de deux intestins."

In the sexually mature woman, the sexual impulse always exists, though its strength varies in accordance with individual inheritance, with physical and mental condition, and with external circumstances, and though its manifestation may be repressed by force of will. The sensation of the sexual impulse in a maiden during the years of development is described by *Goethe* in a masterly manner in the verses.³³

"Meine Ruh ist hin
Mein Herz ist schwer,
Ich finde sie nimmer
Und nimmermehr.
Mein Busen drängt
Sich nach ihm hin,
Ach, dürft ich ihn fassen
Und halten ihn
Und küssen ihn,
So wie ich wollt,
An seinen Küssen
Vergehen sollt.

A resemblance to heat or rut in animals, who exhibit the sexual impulse only at definite periods, those at which the ovules ripen, is manifested in females of the human species only in so far as there

³³ My peace is lost,
My heart is heavy,
I find it never
And nevermore.
My bosom presses
Towards him,
Ah, could I seize him
And embrace him,
And kiss him,
As I long to do,
In his kisses
I should pass away.

is during menstruation a more intense sexual sensibility; but the limitation of the sexual impulse to definite periods, and its close association with reproduction, are not found in women. Education and morality impose artificial limitations on the sexual impulse in women, whilst nature endows this impulse with a coercive power, a fact recognized by thinkers of all times and all peoples. Thus, *Buddha* wrote: "The sexual impulse is stronger than the ankus with which the wild elephant is controlled, it is hotter than flame, it is like unto an arrow driven into the spirit of man." In a similar sense *Luther* writes: "He who wishes to restrain the impulse of nature and not to allow it free play, as nature will and must, what does he do but this, to insist that nature shall not be nature, that fire shall not burn, that water shall not wet, that man shall neither eat, drink, nor sleep." *Schopenhauer* describes the sexual impulse as "the completest outward manifestation of the will to live, the concentration, that is to say, of all wills. * * * The affirmation of the will to live concentrates itself in the act of generation, and this act is its most determined expression." *Mainländer* in his *Philosophy of Deliverance* makes the following statement: "In the sexual impulse lies the centre of gravity of human life. To nothing does man devote a more earnest attention than to the business of generation, and in the pursuit of no other aim does he concentrate the intensity of his will in so striking a manner as in the performance of the act of generation." *Debay* similarly insists on the strength of the sexual impulse, saying: "The union of the sexes is one of the great laws of nature; to that law men and women are subordinated as completely as all other creatures, they cannot escape its operation."

According to the general opinion, the sexual impulse is not so strongly developed in women as it is in men. *Hegar*, *Litzmann*, *Lombroso*, *P. Müller*, and many others, assume that the sexual sensibility of women is less than that of men; *Fürbringer* is inclined to attribute the characteristic of sexual frigidity to the great majority of German wives. I do not believe that this view, of the slight intensity of the sexual impulse in women in general, is well grounded, and can admit only this much, that in adolescent girls who are inexperienced in sexual matters, the sexual impulse is less powerful than in youths of the same age who have undergone sexual enlightenment. From the moment when the woman also has been fully enlightened as to sexual affairs, and has actually experienced sexual excitement, her impulse toward intimate physical contact and toward copulation is just as powerful as that of men. According, however, to the dominant artificial conditions, man assumes it as his right to give free rein to his sexual desires and

to gratify them without regard to consequences, whereas woman, narrowly confined within the boundaries imposed by law and convention, cannot so readily yield to her inclination in the direction of physical love, and must forcibly control that inclination. Moreover, a powerful check on the free indulgence of the sexual impulse is imposed on woman by the consequences of such indulgence, consequences which exist for woman only.

I may further indicate as differential characteristics, that in woman the sexual impulse is more accessible to voluntary control than it is in man, the ardor of female sexual passion is more readily diminished than that of the male; and again that in the female the gratification of the sexual impulse is less narrowly restricted than in the male. Excessive sexual gratification on the one hand and suppression of sexual desire on the other are, generally speaking, less harmful to the female organism than to the male. In these differentiæ is to be found, in my opinion, the influence which determines the type of sexuality in the respective sexes.

The following account is given by *Havelock Ellis* of the differential characters of the sexual impulse in the female: "In courtship, woman plays a more passive part than man; in woman the physiological mechanism of the sexual processes is more complicated, and the orgasm develops more deliberately; the sexual impulse in woman needs more frequently to be actively stimulated; the culmination of sexual activity is attained later in the life of woman than in the life of man, the strength of sexual desire in woman becomes greater after she has entered upon regular sexual intercourse, women bear sexual excesses better than men; the sexual sphere is larger and more widely diffused in women than it is in men; finally, in woman the sexual impulse exhibits a distinct tendency to periodic exacerbations, and it is in any case much more variable than in man." The same author, who has published several notable biological studies on subjects connected with sex, maintains that the source of erotic pleasure in the case of the male lies in activity, but in the female in the passive state, in the experience of compulsion, and he holds that sexual subordination is a necessary element in the sexual enjoyment of women.

Hegar maintains that under the term *sexual impulse* two distinct conceptions are confounded: First, the impulse toward copulation, the desire of carnal union with a member of the opposite sex; secondly, the impulse toward reproduction, the desire for children. At the same time, this author admits that it is questionable if we can properly speak of an impulse toward reproduction, when reproduction is merely a consequence of copulation; in the case of civilized man, at any rate, so much reflection is connected with the idea of

reproduction that it can hardly be proper to speak of anything of the nature of an impulse. In the case of woman, the expression is less unsuitable, since in woman special organs exist for the maintenance of the ovum after fertilization, and these organs may perhaps lead to the production of this peculiar form of mental activity.

According to *Darwin*, a comparatively less intensity of sexual desire is common to the females of all species of the animal kingdom. The female demands a prolonged courtship, and often endeavors for a considerable time to elude the male. In the lowest classes of the animal kingdom the female leads a separate existence as soon as she has been fertilized by the male, the sexual functions being thus subordinated to the maternal. Among birds at the pairing season the male is always the more passionate and active of the two, whilst the female commonly remains passive and occupies herself in building the nest. Among mammals, it is difficult to determine whether sexual feeling is stronger in the female or in the male; but it is certain that sexual relations are seldom long lasting, they continue in most cases only during the period of heat or rut, and at most only till the birth of the young.

From these phenomena witnessed in the animal kingdom, many naturalists have concluded that in females of the human species also, sexual sensibility and the intensity of the sexual impulse are less than in the males, and even that the sexual sense in general is but little developed in the female sex, or sometimes entirely wanting. The complicated apparatus which the primary and secondary sexual characters of the female combine to make up, exists, according to this view, not for the gratification of the sexual impulse, but for the fulfilment of the function of motherhood. "Love in women," says *Lombroso*, "is in its fundamental nature no more than a secondary character of motherhood, and all the feelings of affection that bind woman to man arise, not from sexual impulses, but from the instincts, acquired by adaptation, of subordination and self-surrender."

Mantegazza lays stress on the fact that in the female, sexual desire is very rarely accompanied by pains analogous to those which occur in man, in whom sexual excitement manifests itself in painful tension of the testicle and the seminal vesicles, or in spasmodic, long-continued priapism.

Sergi writes to *Lombroso*: "The normal woman loves to be flattered and wooed by man, but yields herself to his sexual desires only like an animal at the sacrifice. It is well known how much pains must be taken, how many caresses must be expended, before a woman will yield with pleasure to a man's desires, and will share his sexual passion. Without the employment of these means, a woman remains cold and gives as little satisfaction as she feels. There are girls

who are quite obtuse to the joys of love, and either resist energetically a man's approaches, or yield to him passively, without ardor and without enthusiasm. It is well known, also, that among the lower races of mankind, means are employed to stimulate the sexual sensibility in women, means that seem to us to amount to torture; and that the male, with the same end in view, undergoes the most painful operations, from which it is apparent that the slight sexual sensibility of women in these lower grades of civilization is fully recognized." And again: "If a normal woman marries for love, she hides that love deep in her heart, and even on the wedding-day exhibits no great sexual excitement; she often complains later that in her husband the love-fervor of the first days still continues; the very moderate sexual needs of the wife form a natural and most valuable check to the much more powerful passion of the male."

Saint Prospère expresses himself to a similar effect: "Women do not fall in consequence of the excessive power of the senses—in this domain they are overlords, in striking contrast to men, whose weakest side is here. It is not by means of the senses that a woman is to be overcome; her weakness lies elsewhere—in her heart, in her vanity." And *de Lambert* wrote the epigram, "Women play with love, and yield themselves to love, but they do not abandon themselves to love."

Well known also is the saying of *Dante*:

"We know how speedily in women the fire of love is consumed
Unless eye and hand continually supply it with fresh fuel."

On the other hand, it is asserted in the laws of the Hindus that sexual desire in women can as little be satisfied or fed full as a devouring fire can be fed full of combustible materials, or as the ocean can be overfilled by the rivers that pour their waters into it.

Lombroso finds a proof of the sexual indifference of women and of the greater sexual needs of man, in the existence of prostitution, with which can be contrasted the existence only among the degenerate classes (both rich and poor) of a small group of male prostitutes (alfons, souteneurs). This author also refers to the rarity and uniformity in women of the sexual psychoses so frequent in men, as indications of the minor intensity of sexual desire in the former; and he refers also to a series of facts, as for instance, to the occurrence of platonic love, which, though indeed often hypocritical, has a real existence more often in the female sex than in the male; to the long-enduring chastity of girls, and to vows of chastity, which are rarely made except by females; moreover, the ready adaptation of women to polygamy, as well as their scrupulous observance of monogamy, which latter for the male is nominal rather than

actual. If in general the opposite view concerning women prevails, this is ascribed by *Lombroso* to the fact, that love is the most important circumstance in a woman's life. The reason therefore, however, is to be found, not in the erotic sphere, but in the desire for the satisfaction of the maternal instinct, and in a woman's need for protection. A celebrated accoucheur, *Giordano*, has remarked: "Man loves woman for the sake of the vulva; what woman loves in man is the husband and the father. Comprehensively we may express the matter by saying that woman has less eroticism and more sexuality."

As a rule, remarks *Erb*, it is believed that the sexual impulse is less intense in women than in men. This is true enough, he writes, as regards youthful and virgin individuals, who have not yet come into intimate contact with men, and in whom sexual desire and sensibility have not yet been directly excited; later, however, when sexual intercourse has been begun, a change usually takes place, and the sexual needs become active in women also, and demand satisfaction. It is well known that not a few women experience powerful and uncontrolled sensual inclinations, just like those of men. On the other hand, we must insist that quite a large number of women possess the so-called *naturae frigidae*, and have no sensual inclination to sexual intercourse, to which they are either indifferent, or in some cases strongly averse, even regarding it with horror. This lack of the sexual sense in women, is especially common in hysterical subjects, and *Erb* reports that he has encountered quite a large number of cases of this character. Whether in quite healthy women with normal sexual impulse, complete abstinence from sexual intercourse, too often compulsory but sometimes voluntarily undertaken, is harmful in its consequences—this, says *Erb*, is a question very difficult to answer. Many such unfortunate women have assured him that they suffered severely in consequence of their enforced continence; the majority of these became neurasthenic or hysterical. The complication of purely physical influences with mental influences, increases the difficulty of the problem. Neurologists have observed women on whom continence was forced either during marriage or after its dissolution, who thereupon fell into a state of severe nervous exhaustion or nervous excitement, or suffered from threatening or even actually developed psychoses. That sexual abstinence is "absolutely harmless," as moralists and many physicians would so gladly believe, appears to *Erb* a quite unwarrantable assumption.

"In the processes of reproduction," continues *Erb* in his discussion of this subject, "woman is the principal sufferer. With inhuman cruelty, nature has condemned woman to a far more difficult rôle than man in the intercourse of the sexes and in the preservation of the species; she is overpowered and forced by man, she is com-

pelled to make the most severe sacrifices for the sake of the new generation, first when it is germinating within her womb, and later when it is entrusted to her care; and only too frequently she fails to find the respect and protection due to her for the performance of these functions! Compared with the sacrifices made by woman, the temporary continence which is all that is demanded from man will be admitted to be a small matter! It is fortunate that as a rule the young woman who has never come into intimate contact with the male, appears to be endowed by nature with a relatively weak sexual impulse! This unequal and unjust distribution of the male and female rôles on the part of nature may be regretted, but it cannot be altered."

The modern advocates of the rights of women, who demand that in the sexual sphere also, woman should receive emancipation, oppose the view that in the male the sexual impulse is stronger than in the female, and also the view that whilst in the male the impulse is simply one toward sexual congress, in the female the determining motive to intercourse is furnished by the desire for motherhood. They complain of "the perverse repression in woman of the sexual impulse and its physiological gratification," since sexual energy and sexual sensibility are equal in intensity and identical in quality in the female and in the male. Thus, *Johanna Elberskirchen* writes (*Die Sexualempfindung bei Weib und Mann* — Sexual Sensation in Woman and Man): "Body and soul, the whole being is subordinated to a single powerful feeling and impulse, a single will flows through nerves and blood, forcing and driving the female toward the male with irresistible power; the yearning, the longing for the relief of sexual tension, the craving for the euphoria and fleshly delight that dominate the whole personality. And this elementary sexual longing it is that clouds the woman's brain, that drives her into the man's arms, that leads her to forget all the shame threatening her and her child, that brings her to sexual union — not the longing for a child, not the so-called impulse to motherhood." And again: "Woman yearns for love, all her love-organs cry out for love, soul and body * * *. We do not long only for the rude sexual act. We spiritualise it — at least some of us do so; at any rate we individualize it. It is one particular man whom we desire, he alone can still our longing, our bodily and mental hunger for love. He satisfies us with all his love-affinities." Naturally, also, the consequence is deduced, "a free course must be given to sexual sensation in women, and to the satisfaction of sexual desire, within physiological limits, within the bounds of physiological necessity."

Löwenfeld asserts that in the life of woman the sexual functions play a comparatively much greater part than in the life of man,

woman's thoughts and feelings are, that is to say, much more powerfully influenced by sexual matters than those of men; but none the less he is of opinion that in the normal woman the desire for sexual satisfaction is on the average less keen than in the normal man. Distinctly greater in woman is the erotic element only, the need to love and to be loved after an ideal manner, which is excited by the reproductive glands just as much as is the simple sensual desire. Very frequently, manifestations of this ideal need are erroneously attributed to the sensual impulse, yet this latter may be entirely absent in cases in which the erotic element is strongly developed. According to *Löwenfeld*, the sexual impulse is altogether wanting in young girls before the time of puberty, and in elderly women (in the case of the latter we consider this assertion most questionable); this lack of the sexual impulse persists in girls for an indeterminate time even after puberty, as long as they remain free from all experience of sexual stimulation. In this respect they offer a notable contrast to males of the same age. In normal girls, according to the same author, erotic dreams and similar occurrences are entirely wanting, and specific sexual sensations therefore remain absolutely unknown to them; hence it follows that the sexual impulse cannot, properly speaking, arise in such individuals, and in so far as they experience any desire for sexual intercourse it can only take the form of a craving for some enjoyment, the nature of which is entirely unknown. The absolute lack of the sexual impulse (complete frigidity) persists, according to *Löwenfeld*, in a not inconsiderable proportion of women even after their introduction to sexual intercourse — *Effertz* estimates that such complete frigidity is permanent in 10 per cent. of all women — and in a still greater proportion of women the sensual impulse never exceeds a certain minimal intensity (partial frigidity). It is probable that in the higher classes of society, inherited predisposition, education, and perhaps also higher intelligence, combine to diminish the intensity of the sexual impulse. In contrast with these women of frigid temperament, however, we meet with women, certainly in very limited numbers, whose sexual passions are extremely powerful, and whose needs no man can satisfy.

Hegar, who considers that the sexual impulse in women is seldom very powerful, draws the following conclusions in respect of the influence of sexual gratification, on the one hand, or of continence, on the other, on the duration of life and on physical and mental health: "As far as comparisons between married women and women vowed to celibacy (nuns and members of other celibate religious orders) justify any conclusion, sexual activity and inactivity, respectively, would appear to have little influence on the duration of life. Comparisons between married and single women show,

indeed, that the gratification of the sexual impulse and the processes of reproduction are distinctly injurious when experienced before the attainment of complete sexual maturity. In married women up to the age of thirty, in some countries even up to the age of forty, the mortality is greater than in unmarried women. The notably smaller mortality of married women, as compared with unmarried, after the age of forty, is usually explained as the result of the complete fulfilment of the genital functions. It may, however, find a truer explanation in the selection effected by marriage, especially when we take into consideration that from the women thus selected the weaker individuals have been previously weeded out by the processes of reproduction.

"The lesser mortality of married men from the age of twenty upwards is to be explained by the selection of the fit which occurs in marriage, by the smaller proportion of marriages among men engaged in hazardous occupations, and by the deterioration in the quality of the unmarried which results from emigration. Still the directly favorable influence of marriage is undeniable, and, no doubt, the ethical factors of this institution have a beneficial effect, whereas the gratification of the sexual impulse hardly enters into the account.

"Suicide is certainly very little dependent upon repression of the sexual impulse, since all the motives arising out of the affairs of love play together but a small part among the causes of suicide."

"The beneficial influence of marriage in the prevention of insanity is in part apparent merely, since, in the selection exercised by marriage, those predisposed to mental disorder, and those in whom such disorder has already manifested itself, are, for the most part, already excluded. Still, as regards the male sex at any rate, the beneficial influence of marriage is undeniable, and consists principally in the favorable ethical factors of this state. In women, on the other hand, the advantage of marriage is doubtful, since the nerve centres and the nervous system as a whole are strongly affected by the processes of reproduction.

"Satyriasis, nymphomania, and hysteria are in no way dependent upon the repression of the sexual impulse.

"Criminality in the married is comparatively less common than in the unmarried. In criminal assaults on young persons, repressed sexual impulse plays a part.

"Chlorosis is not in any way dependent on repression of the sexual impulse. A disease apparently analogous to chlorosis, occurring in unmarried women from twenty to thirty years of age, is dependent rather on mental causes, and is relieved by other means than marriage, especially by suitable occupation. Marriage and gestation are distinctly injurious in cases of true chlorosis.

"The satisfaction of the sexual impulse, and still more gestation, favor in women the origin and growth of tumors, give rise often to mechanical disturbances, and open the way for the invasion of toxic pathogenic germs.

"Osteomalacia occurs only in parous women."

Moll divides the sexual impulse into two components: The impulse toward intimate contact (in a sense both physical and mental) with a person of the opposite sex, which he calls the contractation-impulse (*Kontrektationstrieb*); and the impulse to bring about a change in the genital organs, which he calls the detumescence-impulse (*Detumescenztrieb*). The former impulse induces intimate physical and mental contact between the two persons concerned, the latter impulse induces the local processes of copulation. In women, detumescence results from the passing off of local swelling and the release of nervous tension in the genital organs, with the discharge of indifferent glandular secretions, notably the secretion of Bartholin's glands, and perhaps also the secretion of the uterine glands. The intensity of the detumescence-impulse in women varies greatly in different individuals, these variations being more extensive than those occurring in the male. In some women the impulse toward intimate contact, the contractation-impulse, is normal, though the detumescence-impulse is wholly wanting (*vide* Dyspareunia).

Runge defines the sexual impulse as the impulse which brings the sexes together. This impulse is subservient to an instinct, namely the instinct of reproduction; that is to say, the sexual impulse induces the individual to perform actions which subserve the purpose of reproduction without the agent's being directly or chiefly concerned with this purpose.

The sexual impulse, as sensation, perception, and impulse, is, according to *von Krafft-Ebing*, a function of the cerebral cortex; a centre for the sexual sense has not as yet, however, been localized. The close relations which obtain between the sexual life and the sense of smell lead to the supposition that the sexual and the olfactory spheres of the cerebral cortex are in close proximity one with the other. The development of the sexual life has its beginnings in the organic sensations of the developing reproductive glands. A mutual dependence now arises between the cerebral cortex as place of origin of sensations and perceptions, and the organs of generation. By anatomico-physiological processes these now give rise to sexual perceptions, representations, and impulses. The cerebral cortex, by apperceived or reproduced sensuous perceptions, influences the organs of generation. This influence is effected by the intermediation of the centres of vascular innervation and ejaculation, which are situated in the lumbar enlargement of the spinal

cord, and are certainly in close proximity one with the other. Both are reflex centres.

The psycho-physiological process embraced in the conception of the sexual impulse is according to *von Kraftt-Ebing* constituted in the following manner :

I. Of the central or peripherally aroused perceptions.

II. Of the pleasurable sensations associated with these.

Hence arises the impulse to sexual satisfaction (*libido sexualis*). This impulse becomes stronger in proportion as cerebral excitement, consequent on appropriate perceptions and the working of the imagination, strengthens the intensity of these pleasurable sensations. If the conditions are favorable to the performance of the sexual act by means of which satisfaction is attained, the continually increasing impulse finds expression in action ; in other circumstances, inhibitory perceptions intervene, sexual excitement diminishes, the activity of the centre for erection is inhibited, and the sexual act itself is prevented. In the case of civilized humanity the ready action of such perceptions for the inhibition of the sexual impulse is necessary and decisive. On the strength of the impulsive perceptions the constitution and various organic processes have an important influence ; on the strength of the inhibitory perceptions, education and the cultivation of self-control are powerfully operative.

In addition to mental influences, all forms of local irritation of the sensory nerves of the female genital organs and adjacent parts, by internal processes or external friction, serve to increase the strength of the sexual impulse. Among internal processes which stimulate the erectile centre by centripetal impulses must be included, the stimulus of the enlarged graafian follicle, stasis in various vascular areas of the genital organs in consequence of a sedentary mode of life, abdominal plethora from excessive consumption of food and stimulating drinks, and habitual constipation. External friction may be in the form of intentional manipulation, but it may be due to certain bodily attitudes or to the arrangement of the clothing.

In normally constituted individuals, the sexual impulse is by no means constant in its intensity. Apart from the temporary indifference resulting from sexual gratification, and apart from the decline in the impulse that occurs after prolonged continence, ensuing after a certain reactionary intensity of desire has been happily overcome, the mode of life has a very great influence. The town-dweller, who is continually reminded of sexual matters, and continually solicited to sexual intercourse, is in any case more subject than the countryman to sexual excitement. A sedentary and sheltered mode of life, a chiefly animal diet, the free use of alcohol and of spices,

and the like, have a stimulating action on the sexual life. In the female, the sexual impulse is stronger just after menstruation. In neuropathic women this increase of excitement may occur to a pathological degree. Not infrequently also in the climacteric period, women are subject to sexual excitement due to pruritus, especially in those neuropathically predisposed. *Magnan* reports the case of a lady who was subject to matutinal accesses of intense erethismus genitalis. The same author writes of a young lady who since puberty had been subject to continually increasing sexual impulse, which she gratified by masturbation. Gradually it came to pass that the sight of a good-looking man produced violent sexual excitement, and on these occasions, since she felt herself unable to answer for her own conduct, she used to lock herself up in her bedroom till the storm had passed away. Ultimately she surrendered herself to any available man in order to obtain rest from her torturing desires, but neither intercourse nor onanism gave her relief, so that she was finally sent to an asylum.

As regards pathological increase of the sexual impulse, hyperæsthesia sexualis, the constitution of the individual is, according to *von Kraft-Ebing* (*Psychopathia Sexualis*), of great importance. He writes: "With a neuropathic constitution, a pathological increase of sexual desire is often associated, and such individuals bear for the greater part of their life the heavy burden of this constitutionally anomalous sexual impulse. The intensity of the sexual impulse may be such as to amount to an organic compulsion, and the freedom of the will may thus be seriously imperilled. Non-satisfaction of this desire may induce a true sexual heat (like that of lower animals), or a mental state characterized by sensations of anxiety, in which the individual yields to the impulse, and his responsibility for his action is most questionable. Should the person so affected not give way to his desire, he runs the danger, by this enforced abstinence, of injuring his nervous system by the induction of neurasthenia, or of seriously aggravating neurasthenia that already exists.

"Excessive sexual desire may arise either from peripheral or from central causes. The former variety is less common. Such cases as do occur, may arise from pruritus of the genitals, from eczema, or from substances which by their remote local action stimulate sexual desire, such for instance as cantharides.

"Sexual excitement of central origin is common in those suffering from congenital neuropathic predisposition, in hysterical subjects, and in states of mental exaltation. In such cases, when the cerebral cortex, including the psychosexual centre, is in a state of hyperæsthesia (abnormal excitability of the imagination, facilitated asso-

ciation of ideas), not only optical and tactile sensations, but also auditory and olfactory impressions, will arouse lascivious perceptions.

"Sexual hyperæsthesia may be continuous, with exacerbations, or intermittent, and even periodic. In the last case, according to *von Krafft-Ebing*, it is either an independent cerebral neurosis, or else a partial manifestation of a general condition of mental excitement (*mania, dementia paralytica, dementia senilis*, etc.).

Erotogenic zones, the stimulation of which leads to an increase in the intensity of the sexual impulse and of sexual sensibility, are in woman first of all and principally the clitoris, which indeed is said to be the only zone of this nature in the virgin state (an opinion held by *von Krafft-Ebing* and others, but certainly most improbable); next to this comes the whole of the external genitals, and especially the parts covered with hair; also the vagina by friction and inter coitum; finally the nipple and its areola when stimulated by titillation — an increase of the excitability of this region appears to result from suckling.

According to *Hensen*, the direct stimulation of the sexual impulse proceeds by way of the dorsal nerve of the (penis or) clitoris; he assumes, however, that certain states of the reproductive glands are able to induce an increase in the irritability of the centres connected with the aforesaid nerves. In women it certainly appears that particular states of the ovary have a stimulating or inhibiting influence respectively on sexual excitement, so that we might ascribe to the ovaries the rôle of a regulator of the sexual impulse. The processes that occur in the ovary at the time of the ripening and rupture of the graafian follicle, and the resulting tension of the follicular wall, induce by stimulation of the ovarian nerves an increased sensibility of the central zones, and produce in a menstruating female a condition of increased sexual excitability, so that slight stimuli will give rise to a powerful orgasm more readily than would otherwise be the case, when the reflex irritability of the centre is less pronounced and the sexual impulse is consequently less intense. Still more than during these ordinary menstrual processes may this stimulation be effective at the time of the menarche, when the changes in the ovary occur for the first time and with the greatest intensity, so that at this time the individual may be especially susceptible to sexual stimulation.

At such times of sexual excitement, very slight external peripheral stimuli, in the form either of tactile stimulation of the sensory nerves of the skin and the external genital organs, or of stimulation of the imaginative and perceptive faculties of the brain, suffice to induce a powerful increase of the sexual impulse; whereas at

other times, at which no particular sexual excitement exists, much stronger stimuli are needed to produce such an effect. Thus the sexual impulse in women is more readily and more powerfully increased in proportion as the central organ is in a condition of temporarily enhanced excitability in consequence of the condition of the ovaries.

The gratification of this impulse, the act of copulation, produces the specific sensation of sexual pleasure; in the female this is effected chiefly by friction of the glans clitoridis, the organ when erect projecting downwards at a right angle, and pressing upon the intromitted penis—the friction of the glans produces powerful mechanical stimulation of the numerous plexuses of sensory nerve fibres, which terminate in the genital corpuscles of *Krause*. In woman, then, we find in the ovary the place of origin and the means of regulation of the sexual impulse, and in the clitoris we find the seat of the specific sensation of sexual pleasure.

In the poorer classes of society, an increase of the sexual impulse occurs in women chiefly in consequence of bad example and of unfavorable domestic conditions, such as lead to persons of opposite sexes sleeping in the same bed, and also in consequence of the abuse of alcohol. In the well-to-do classes, it is the perusal of modern equivocal romances, visits to theatres, balls, and evening parties, and, speaking generally, idleness combined with luxurious living, that serve to stimulate the sexual impulse in woman.

A certain dependence of the sexual impulse upon seasonal variations appears to exist also in the human species. At any rate in certain months of the year, a definite increase in the number of conceptions continues to recur, which indicates that during these months a larger number of sexually mature individuals is engaged in the discharge of sexual functions. *Rosenstadt* regards this as the manifestation of a "physiological custom," immanent in the physical constitution of civilized man, and inherited by him from his animal ancestors. He explains it in the following terms: "Primitive man inherited from his mammalian forefathers the peculiarity of reproducing his kind only during a certain definite period, the period of heat or rut. After humanity had entered upon this period, copulation was effected *en masse*, as was easy in view of the primitive community of sexual intercourse before the origin of marriage. In the course of his progress toward civilization, however, man began to reproduce his kind indifferently throughout the entire year; but the original "physiological custom," in accordance with which reproduction occurred at definite seasons only, did not disappear, and persists, indeed, to a certain extent even to the present day as a survival of earlier mammalian life, and manifests itself in the annual recurrence in certain months of an increase in the number of con-

ceptions. The analogy in structure and function between the genital organs of the human species and those of other mammals (the female anthropoid apes do not merely exhibit from time to time a period of heat, but are subject to a more or less regular menstruation), which for the most part reproduce their kind only at certain definite periods, leads to the conclusion that in the human species also the sexual impulse may originally have awakened only at a particular season of the year, and that the persistence of this physiological custom in man, in spite of the fact that sexual intercourse occurs all through the year, and notwithstanding that the conditions necessary to awaken the sexual impulse are actually perennial, must be ascribed to inheritance."

This view, which is maintained also by other gynecologists, finds support in *Kulischer's* assumption, based upon ethnological investigations, according to which coupling in primitive man took place only at certain seasons, namely, at spring and at harvest-time. In support of this view, which was held also by *von Hellwald*, *Kulischer* refers to a number of actual and symbolical practices among different races, which make the assumption extremely probable.

Sexual desire in women, the sexual impulse, outlasts the proper sexual life, and manifests itself even after the cessation of menstruation, when the possibility of conception has passed away; it appears, therefore, to have no necessary connection with the function of ovulation.

This is indicated by the always respectable number of women who enter upon marriage even after the climacteric age. Thus the percentage of brides who were more than 45 years of age was: In Prussia, 2.58 per cent.; in England, 1.38 per cent.; in Sweden, 1.53 per cent.; in Ireland, 0.31 per cent. Of quite peculiar interest are the figures relating to elderly women who marry men considerably younger than themselves. Thus we learn from the tables of *Routh* that in the space of 10 years in Ireland:

Women between the ages of 46 and 55 years married	
Men below the age of 17 in.....	1 instance.
Men between the ages of 17 and 25 in.....	35 instances.
Men between the ages of 26 and 35 in.....	145 instances.
Men between the ages of 36 and 45 in.....	227 instances.
And women of ages greater than 55 years married	
Men below the age of 17 in.....	1 instance.
Men between the ages of 17 and 25 in.....	3 instances.
Men between the ages of 26 and 35 in.....	12 instances.
Men between the ages of 36 and 45 in.....	15 instances.
Men between the ages of 46 and 55 in.....	52 instances.

In England during the year 1855 the age of the bride exceeded the climacteric age in 778 instances. The brides were:

From 46 to 50 years of age in.....	135 instances.
From 51 to 55 years of age in.....	219 instances.

From 56 to 60 years of age in.....	89 instances.
From 61 to 65 years of age in.....	22 instances.
From 66 to 70 years of age in.....	7 instances.
From 71 to 75 years of age in.....	3 instances.
From 76 to 80 years of age in.....	3 instances.

In Bohemia in the year 1872 the oldest bride numbered no less than — 86 years.

Börner reports cases in which the sexual impulse remained in full activity after the change of life, and in some cases was greatly increased in intensity — these latter individuals being in a condition of real torment, which induced them to masturbate to obtain relief.

The sexual impulse may be present in cases in which the ovaries are entirely wanting. Thus, *Hauff* reports the case of a young girl who had no ovaries, but was nevertheless excessively addicted to masturbation. *Gläveke* speaks of a puella publica in whom the uterus and the ovaries were entirely absent, but who asserted that she experienced during coitus active sexual sensation. Both *Kussmaul* and *Puech* report similar experiences in cases of absence or arrested development of the uterus.

As regards the effect on the sexual impulse of the operation of oöphorectomy, most authors state that no change occurs; still, there remain many who express the opposite opinion. From the collective summary of cases bearing on this question made by *Gläveke*, it appears that after extirpation of the ovaries the sexual impulse remains unchanged in the great majority of cases, or at most is but slightly diminished in intensity. *Hegar* states that he has often witnessed a diminution of the sexual impulse after oöphorectomy, but that this decline is by no means constant, indeed he states that one of his patients assured him that in her case no decline in the intensity of the sexual impulse had followed the operation. Similarly variable reports were the experience of *Schmalfuss*. In one case he found there was but little sexual inclination; in one case, disinclination; in one case disinclination at first, followed by a return of inclination. *Bruntzel* reports that in four patients subjected to oöphorectomy, in two cases the sexual impulse persisted, but in the remaining two it was extinguished. *Köberle* is of opinion that sexual inclination diminishes as a result of this operation. *Peaslee*, on the contrary, asserts that the patients remain striking examples of womanhood, in whom all the qualities peculiar to their sex are preserved. *Péan* observed as a rule no difference in the sexual impulse to result from this operation, but he considers that the patients are apt to describe in exaggerated terms the amount of sexual feeling that remains to them. In one case, *Spencer Wells* observed after oöphorectomy an increase in sexual excitability;

Tissier had the same experience, and this author believes that in these cases the sexual impulse is generally preserved. On the other hand, *Bailly* observed a case, in which both ovaries were removed on account of new growths, where the sexual impulse at first became excessive, and then completely disappeared. *Anger* and *Goodell* speak in the same sense.

I am myself acquainted with a woman twenty-six years of age who in girlhood underwent oöphorectomy on account of extremely severe nervous troubles associated with menstruation; she had not experienced in consequence any loss of the sexual impulse; she married a man belonging to the upper strata of society, and consulted me four years later to learn if she could by any means be rendered capable of bearing a child. Two other cases have come within my personal experience in which young women married after extirpation of the ovaries, and in whom sexual desire and sexual sensation were all that could be wished.

In twenty-seven women who had undergone the operation of oöphorectomy, *Gläveke* made inquiries regarding the three following points: First, whether the sexual impulse had been affected by the operation; secondly, whether during intercourse sexual pleasure was experienced to the same degree as formerly; and thirdly, whether during intercourse any kind of difference was observed as compared with pre-operative experience. He obtained the following results:

Sexual inclination was

Unaffected in 6 cases.....	22 per cent.
Diminished in 10 cases.....	37 per cent.
Extinguished in 11 cases.....	41 per cent.

Sexual pleasure during coitus was

Unaffected in 8 cases.....	31 per cent.
Diminished in 10 cases.....	38 per cent.
Extinguished in 8 cases.....	31 per cent.

In a considerable number of cases the sexual impulse was thus found by *Gläveke*, not indeed to be entirely extinguished, but still notably diminished. In another set of cases, the sexual impulse was entirely extinguished, but only in one case was there actual aversion to coitus. The women readily permitted intercourse when their husbands desired it, but remained themselves quite indifferent. The greater number of these women stated that the specific sensation of pleasure during coitus was markedly weakened, but not entirely lost; in a small proportion, this sensation was completely extinguished. In the case of seven women who complained that coitus was very painful, *Gläveke* found that the calibre of the vagina was much diminished. In these cases, the sensation of pleasure during coitus was either greatly diminished or completely extinguished. The women permitted intercourse very unwillingly, their unwilling-

ness arising, not from any actual aversion, but because they dreaded the pain which coitus produced. An extremely hysterical woman, affected with severe prolapse of the uterus, stated that every attempt at intercourse was frustrated by violent hysterical convulsions. The sexual impulse appears always to suffer first and most severely, and only after this is the sensation of pleasure during coitus affected. In a few women only, according to the experience of this author, was the sexual impulse quite unaffected by the removal of the ovaries.

Amputation of the clitoris appears notably to diminish both the sexual impulse and the sensation of sexual pleasure, but the results of clitoridectomy for the cure of masturbation are by no means always favorable. In the women of the Russian sect of the *Skopstki*, the clitoris, the nymphæ, and a part of the labia majora are removed, in order to destroy sexual desire. According to *von Krafft-Ebing* it is probable that in the virgin the clitoris is the only erotogenic zone, that is to say, that only by the stimulation of the clitoris can erection, the orgasm, and the sensation of ejaculation be induced. It is probable that the vagina becomes erotogenic only as a result of coitus; thenceforward, however, the erotogenic significance of the clitoris is notably lessened, and in multiparæ may entirely disappear.

NYPHOMANIA, ANÆSTHESIA AND PSYCHOPATHIA SEXUALIS.

The sexual impulse in women is subject to morbid changes, both in the way of increase and of diminution, exhibiting abnormal violent increase (nymphomania), or declining to the state of complete frigidity and sexual indifference, or, finally, manifesting itself in some perverse manner (psychopathia sexualis).

Psychopathically increased sexual impulse in woman is known as nymphomania or uteromania. In such women there is a dominant state of psychical hyperæsthesia, principally in the genital sphere. The most indifferent perceptions give rise to erotic sensations and to lascivious impulses. All sensory perceptions obtain a sexual content, and induce stimulation of the cerebral cortex. All sensation and all activity in such unhappy beings ultimately concentrates itself in the act of copulation, or in some other form of sexual gratification, the greatest perversities of sexual practice frequently arising, masturbation, tribadism, and, for the most part, prostitution, even in the case of married women.

The nymphomaniacal woman, says *von Krafft-Ebing*, endeavors to allure men by means of exposure of the genital organs or indecent gestures; the sight of man produces intense sexual excitement, which is gratified by masturbation or by stimulatory movements of the pelvis. According to this author, nymphomania is not very infre-

quent at the climacteric period; it may even occur in old age. Abstinence in association with simultaneous excitement of the sexual sphere by mental or by peripheral stimuli (pruritus pudendi, oxyuris, etc.), may induce these states, probably, however, only in those hereditarily predisposed.

The history of antiquity contains records of the corrupt practices of nymphomaniacal empresses. Thus, Messalina furnishes a well-known historical example of the abnormal violence of a pathologically intensified sexual impulse in woman. She was given the agnomen of *invicta*, having received the embraces of fourteen athletes. Pliny says of her, *die ac nocte superavit quinto et vicessimo concubitu*; and Juvenal writes of her the verses,

. tamen ultima cellam
Clausit, adhuc ardens rigidæ tintigine vulvæ
Et resupina jacens multorum absorbuit ictus
Et lassata viris, necdum satiata, recessit.

In corrupt Rome, Messalina was not the only woman *necdum satiata*, ever insatiable; we need only refer to the orgies of an Agrippina, a Livia, a Mallonia, or a Poppæa; and Seneca hurls against the women of his day the reproach, *adeo perversum commentæ genus impuditiæ viros ineunt*. And of Cleopatra, the beautiful Egyptian queen, Marcus Antonius writes in a letter to his physician, Soranus, that she had such violent sexual desire as to lead to her having connection in a brothel with 106 men.

Through the report of Herodotus it is well known that the pyramid of Cheops was built by the numerous lovers of the daughter of this king, who raised this enormous monument in recognition of the innumerable times she had yielded herself to their desires. On record also are the sexual excesses of the Roman ladies at the festival of Saturn, the festival of the Bona Dea, and the festival of Priapus; indeed, many of these women allowed themselves to be debauched in the temples (*Ploss and Bartels*).

But returning to the present day, both gynecologists and alienists record numerous cases of great pathological increase in the intensity of the sexual impulse in women. According to Lombroso, such continued ardency of sexual desire occurs chiefly in women with an inherited tendency to crime and to prostitution, whose natures exhibit a commingling of lasciviousness with barbarism. He gives examples of such women, one of whom surrendered herself to her husband's laborers; another had as her lovers all the desperadoes of Texas; a third had intercourse with all the herdsmen of her village; a fourth, though her husband occupied a good social position, led the life of a prostitute; a fifth, a cultured and

intelligent woman, entertained a common bricklayer, and wrote to him letters full of shameless declarations of her sexual passion; further he writes of a series of criminals, in whom, indeed, increased sexual desire is a common phenomenon; one of these, a thief, experienced sexual excitement at a mere glance at a good-looking man; a murderess, in whom lascivious feeling induced masturbation whenever she saw a man, and who made experiments in sexual intercourse with dogs; another, who often took to bed with her, in addition to her son, three or four men selected at random from the streets; and many others. *Jolly* reports the case of a widow, a celebrated *lionne* of the *demi-monde*, who kept in her desk, side by side with devotional literature, a number of lascivious books and preparations of cantharides, and entertained quite a number of powerfully-built lovers drawn from the lowest *canaille*.

In hysterical women the sexual impulse is frequently excessive, and may increase to such a degree as to produce hallucinations of coitus; sometimes, on the other hand, the impulse is extinguished, or psychopathically metamorphosed, passing in a most paradoxical manner from sexual frigidity to lascivious reflections and continuous occupation with sexual affairs; not uncommon in such women are false accusations of indecent assaults of which they assert themselves the victims.

Lombroso gives several examples of the increase of the sexual impulse in hysterical women: "A hysterical girl visited a physician, and said to him: 'I am still a virgin, take me;' she submitted him to the utmost extremity of provocation, and asserted afterward that she had been violated.' Another hysterical subject, a rich young lady, met a workman in the street, offered herself to him, was accepted, and when she returned home related the affair with laughter. A third sought men from the street in order to find one suffering from syphilis, her object being to infect her own husband with the disease."

According to the observations of *Schüle*, young married, hysterical women not infrequently run away with a waiter during the honeymoon journey. This author also points out that in women moral insanity is especially apt to manifest itself during the first years of married life. Many advocate a far-reaching libertinism, and threaten to enter a brothel. In these forms we observe, in addition to ill-temper and malignity, especially obscenity and tribadism.

Such a case, observed by *Giraud* and quoted by *von Krafft-Ebing*, is the following: Marianne L., of Bordeaux, during the night, while her master was sleeping soundly under the influence of narcotics she had administered, was in the habit of giving up her

master's children to her lover for his sexual gratification, and made them witnesses of the most immoral scenes. It appeared that L. was hysterical, suffering from hemianæsthesia and convulsive seizures, and that before her illness she had been a sensible and trustworthy individual. After the illness, however, she prostituted herself in the most shameless manner and completely lost her moral sense.

Galen relates of his own mother that she suffered from nymphomania, and that in the attacks she bit her female slaves like a wild animal.

As a negative aspect of the sexual impulse in woman we must regard the absence of the impulse, or anæsthesia sexualis, and also the deficiency of the sensation of pleasure during the act of copulation, or dyspareunia.

Of dyspareunia we shall speak more at length later, in connection with the pathology of copulation. As regards the entire lack of the sexual impulse, however, in women whose genital organs are normally developed and normal in the performance of their functions, and whose cerebral condition is also normal, we must consider such lack an extremely rare condition, if indeed it ever occurs. It is only in cases in which the female genital organs are wanting, wholly or to a considerable extent, or in which there are important cerebral disturbances or states of mental degeneration, that the sexual impulse is wanting.

Normally, in the young, sexually unspoiled girl, the sexual instinct³⁴ slumbers in the cerebral cortex, but becomes active, as sensation, perception, and impulse, as soon as the cerebral centre has been aroused by mental impressions or by physical peripheral stimulation of the genital organs and their environment. Among stimuli of the latter class must be reckoned the menstrual stimulus, set on foot by the developmental processes of puberty. These stimuli arouse in the cerebral cortex sensations and perceptions which, rising to specific sexual feelings, produce an impulse to increase the intensity of these feelings by purposive action; thus is awakened the sexual impulse, the strength of which is extremely variable.

Only when the cerebral cortex, as the place of origin of sensa-

³⁴ It seems expedient to point out that whilst in this work the German word *Geschlechtstrieb* has in the great majority of cases been rendered in English by the term *sexual impulse*, on two or three occasions, as here, the author speaks of the *Geschlechtstrieb* as composed of *sensation*, *perception*, and *impulse* (*Drang*), when for obvious reasons the rendering *sexual instinct* becomes necessary. Though the term *sexual impulse* is, I think, in more general use than the term *sexual instinct*, it must not be forgotten that the inclination towards sexual congress is composite in nature, and that an *impulse* in the strict sense of the term is only one element in its composition.—TR.

tions and perceptions, fails to perform its functions in the manner just described, or when the anatomico-physiological processes in the genital organs which normally act as peripheral stimuli fail to occur, or when there is a failure in the conducting tracts, are sexual perceptions and impulses lacking. Such anomalies may be congenital. A milder form is that, likewise congenital, in which a woman has a sexually "cold nature;" in these cases the sexual impulse is not completely wanting, but it is so slight in intensity that it can be awakened only by very powerful stimuli, and in her normal state the woman so affected is quite free from any wish for sexual gratification.

Such congenital subnormal intensity or entire lack of the sexual impulse may be due to very various causes. According to *von Krafft-Ebing*, these causes may be organic or functional, mental or physical, and central or peripheral. The declining intensity of the sexual impulse with the advance of years, and the temporary disappearance of that impulse after the sexual act, are both physiological occurrences. Education and mode of life have a marked influence on the intensity of the *vita sexualis*. Strenuous mental activity, earnest study, severe physical exertion, mental depression, and sexual continence, notably diminish the excitability of the sexual impulse. At first, indeed, abstinence leads to an increase in the intensity of the impulse, but sooner or later the functional activity of the organs of generation declines, and therewith also the intensity of the sexual impulse. As peripheral causes of diminution or disappearance of the sexual impulse, *von Krafft-Ebing* mentions oöphorectomy, degeneration of the reproductive glands, marasmus, sexual excess, whether in the form of coitus or of masturbation, and alcoholism. In like manner is to be interpreted the disappearance of the sexual impulse in general disorders of nutrition (diabetes, morphinism, etc.).

A decline in the intensity of the sexual impulse in consequence of degeneration of the conducting tracts, is found, according to *von Krafft-Ebing*, in diseases of the brain and the spinal cord. Central affection of the sexual impulse may be due to organic disease of the cerebral cortex (*dementia paralytica*, general paralysis of the insane, in the later stages), or it may be due to functional disorder, such as hysteria, or to mental diseases (*melancholia* or *hypochondriasis*).

Finally, in some instances, the sexual impulse in women manifests itself, not in the normal manner with copulation with the male as its goal, but in a form demanding some abnormal kind of gratification (*psychopathia sexualis*), whether it be because sexual intercourse with the male affords the woman no enjoyment, or simply because no opportunity exists for such intercourse.

[Masturbation is very frequent; the habit having been acquired

from bad example by the girl during the menarche, it is sometimes continued by the wife during married life. In these cases we often find distinct changes in the genital organs, such as hypertrophy of the clitoris, enlargement and bluish discoloration of the nymphæ, retroversion of the uterus, tenderness and displacement of the ovaries, considerable vaginal discharge, and sometimes menorrhagia.

Kussmaul draws attention to the connection between masturbation and nymphomania, on the one hand, and imperfect development of the uterus and the other genital organs, on the other. *Campbell* records the case of a woman addicted to masturbation, who had never menstruated, and who, in addition to imperfectly developed genital organs, had a dermoid cyst of the ovary. In a young woman who indulged in masturbation, *Aran* found that the uterus and its annexa were imperfectly developed. *Vaddington* also describes a case of abnormal sexual impulse which was associated with absence of the uterus.

Trogger reports the case of a woman twenty years of age, who had been six months married to a healthy, potent man, was herself healthy and blooming, with a good family history, and had never suffered from any severe illness. At the age of thirteen she had learned to masturbate, effecting this by stimulation of the clitoris. Now she found no gratification in coitus, so that she continued to masturbate, and during coitus obtained satisfaction by manual friction of the clitoris. Examination showed that the clitoris was strikingly large, the vagina flaccid, and that there was some vaginal discharge; in other respects the genital organs were normal.

Not infrequent, it may be in those whose mental condition is in other respects fairly normal or it may be in psychopathic subjects, is the existence of contrary sexual sensation, or sexual inversion, a condition which has been described by *Casper*, *Westphal*, *von Kraft-Ebing*, and *Moll*, and has indeed been well known since the days of antiquity. In the case of a considerable number of notable women, homosexual practices have been recorded. According to the observations of *Coffignon*, in Paris the homosexual instinct, when occurring in other women than prostitutes, is found chiefly among the ladies of the aristocracy.

Of homosexually inclined women, some engage in the practice of tribadism, familiar to the ancient world, and recorded by *Martial* in a satire, in which sexual gratification is obtained by mutual friction of the genital organs, or by penetration of one woman's clitoris into the vagina of the other; whilst some indulge in the *amor lesbicus*, in which gratification is obtained *lambendo linguâ genitalia*, a very ancient practice indeed, transported from Phœnicia to Greece (where in especial it was indulged in by the women of Lesbos), and later

from Syria to Italy, where it was widely diffused among the Romans of the imperial age. *Sappho*, celebrated as the tenth muse, is supposed to have been addicted to the practice of Lesbian love.

All such homosexual (female) individuals are, then, endowed with the perverse instinct toward sexual connection with women instead of with men. In such cases, the genitals are usually quite normal; sometimes, however, the woman thus affected is markedly of a male type, being called by *von Kraft-Ebing* a *gynandrist*, the affection itself being termed *gynandry*; when the woman concerned not only possesses a homosexual impulse, but also in other respects exhibits tendencies properly characteristic of the male sex, she is called *virago*, and the affection is termed *viraginity*.

I had under my care such a woman, belonging to the upper circles of society, who had been married sixteen years before, had lived a married life for six years (during which she remained barren), and had then separated from her husband. She was of a very masculine disposition, smoked, gamed, drank like a student, and preferred to wear men's clothing, and she bestowed her affections on a female companion. Examination of the genital organs disclosed no abnormality beyond a slight vaginal catarrh. Menstruation was regular, and the general appearance showed no departure, with the exception of a slight moustache that shaded the upper lip, from that of a normal feminine beauty.

Mantegazza is of opinion that in the case of many unhappy marriages, in which the source of the unhappiness is obscure, the trouble is to be found in the homosexual inclination of the wife. *Martineau* and *Moll* report that married women who are homosexually inclined, indulge in sexual intercourse with other women behind their husbands' back. *Duhousset*, at a meeting of the Anthropological Society at Paris in 1877, related the almost incredible case of a married homosexual woman who, in intercourse with another woman, transferred to the latter her husband's semen, so as to induce pregnancy.

Many writers on forensic medicine, *Tardieu*, *Pfaff*, *Schauenstein*, *Wald*, and *Mantegazza*, for instance, have recorded that in numerous circles of European society women practice masturbation and tribadism (sodomy, so called) with dogs and monkeys; and *Plutarch's* statement is well known regarding Egyptian women and the sacred goat, Mendes, that the women who were locked in with this animal practiced sodomy therewith; and again it is asserted that the serpents in the temple of Æsculapius and also in private houses were employed in the practice of sodomy.

Von Maschka records a case which came before the courts a few years ago in Prague, in which a woman forty-four years old con-

fessed that "in consequence of the very ardent temperament she possessed, she had, perhaps, as often as six times indulged herself with her house dog, which jumped between her legs and licked her; that she took the animal between her bare legs, stroked its belly until its penis became erect; then, supporting herself on the back of a chair, she pressed the animal against herself, introduced its penis between her labia majora, and let it continue its movements until its semen had been ejaculated." Examination of the genital organs of this woman disclosed no abnormality.

Schauenstein reports the case of a girl who carried out unchaste practices with a little dog to an utterly immoderate extent, so that after the lapse of some years she died in an asylum. In a case recorded by *Wald*, a maid servant was observed in lewd practices with a poodle; she supported herself on elbows and knees, while the dog copulated with her from behind.

A woman about thirty years of age, who had lived with her husband in sterile marriage for nine years, complained to me that she had not for a long time had sexual intercourse, since during copulation she not only experienced no sexual pleasure, but actually felt a loathing to the act; on the other hand, she was subject to an uncontrollable impulse to handle the genital organs of children, both of the male and of the female sex, and this performance gave her sexual gratification; during the menstrual period, this impulse overpowered her will. Local examination in this patient showed that the uterus was enlarged and retroflexed, and that there was anæsthesia of the vagina.

Anjel reports the following case of periodic psychopathia sexualis, associated with menstruation. A lady of quiet disposition, near the climacteric. Serious congenital predisposition. During youth suffered from attacks of minor epilepsy. Married, but childless. Several years ago, after violent emotional disturbance, she had a hystero-epileptic seizure, followed by post-epileptic mania lasting several weeks. Thereafter, insomnia for several months. As a sequel, continually recurrent menstrual insomnia, accompanied by an impulse to embrace boys under ten years of age, to kiss them, and to handle their genital organs. Impulse toward coitus, to close sexual contact with a grown man, non-existent at this time. The patient often speaks openly of her morbid impulse, and begs that she may be supervised, as she feels unable to answer for her own conduct. In the intervals, however, she carefully avoids all reference to the matter, is strictly decent in her conduct, and in no way sexually ardent.

Tribadism is frequently mentioned by the writers of classical antiquity, especially by those of Greece, where the cult of naked

beauty encouraged sexual excitement of this character. This form of unchastity was common among the flute-playing girls of Greece, and at the secret festivals of such associates Aphrodite Peribasia was invoked. *Lucian*, in his dialogues of hetairai, depicts the intensely passionate nature of these homosexual unions between girls. *Lom-broso* reproduces *Juvenal's* description of such a love-feast. "When the flute calls to the dance, the mænads, inflamed with wine and beer, loosen their long tresses, they sigh languishingly and eagerly, and an ardent desire draws them one to another, the desire and the passion of the dance gives their voices an alluring sound; nothing now can serve to bridle their unrestrained desires. *Lacasella* swings her wreath, which she has won in the contest of lascivious gestures and movements, but even she must give way before Medullina with her ardent postures. About these games there is no trace of unreality, and the most rigid Spartan, hardened from the very cradle, even old Nestor himself, notwithstanding his hernia, could not fail to be stimulated by such an inflammatory spectacle."

In the present day, also, the practice of tribadism is more widely diffused than people in general imagine. I have often encountered instances of it in ladies of good position, who were past their first youth, who would not or could not marry, and who undertook extensive and long-enduring journeys with a female "companion," of similar age, or perhaps a little younger. Their erotic needs, which could not be gratified in normal fashion, led to this sexual perversion—a tendency observable especially in persons with neuro-pathic predisposition, or with a liability to hysteria or to epilepsy. Sometimes such girls, even before puberty, show an inclination to wear boys' clothes, to avoid all feminine manual occupations, and to examine and to handle the genital organs of their playmates. Even after puberty, such tribadists like to make a parade of masculine attitudes, they have their hair cut short, wear clothes of a masculine cut, smoke a great deal, and show in their conversation, and still more in their letters, great exaltation of the passions. It not infrequently happens that an elderly lady who has lived well in her day, and from youth upward has had much intercourse with men, comes at last to lament her worthlessness to men, and from this proceeds to the idea of obtaining sexual enjoyment by means of tribadism. The tribadistic union sometimes lasts for several years, but in most cases the alliances are quickly and frequently changed.

According to *Taxil*, tribadism is fairly common among the married women of Paris, and in upper-class women is extremely prevalent. This author describes with what industry and perseverance many elderly tribadists endeavor to win for themselves and to seduce

young girls, just as old women often work hard to gain money for the enjoyment of the favored person.

In these unions, according to the descriptions of *Lombroso*, very remarkable phenomena occur. A particular jargon arises with tender designations for this or that bodily beauty; a violent jealousy develops, and a newly united pair keep together as much as possible for fear of losing one another's affection; the "friends" tread always in one another's footsteps. This author rightly points out that the very numerous romances describing relations of this kind prove the diffusion of this vice in "high life." Novels of this class are referred to by *Mantegazza* in his book, "Woman as Criminal and Prostitute." He mentions: *Diderot*, "La Religieuse;" *Balzac*, "La Fille aux Yeux d'Or;" *Gautier*, "Mademoiselle de Maupin;" *Feydeau*, "Le Comtesse de Cholis;" *Flaubert*, "Salammbô;" *Bélot*, "Mademoiselle Giraud ma Femme;" *Willbraud*, "Fridolins Heimliche Ehe;" *Graf Stadion*, "Brick and Brack;" *Sacher-Masoch*, "Venus im Pelz." *Zola*, also, in "Nana" and "La Curée," and *Butti* in "L'Antona," make some reference to this matter.

Sauval relates of the dissolute life at the court of the French king, Francis I, that the women learned also to play the part of men; a princess had a hermaphrodite maid-of-honor, and the court and all Paris gossiped about the Lesbian-loving ladies, whose husbands were delighted, since they were thus quite freed from jealousy, and prized their wives above all on this account. Such a mode of life was so pleasing to many ladies that they refused to marry, and refused also to allow their "friends" to marry.

Tribadism is very common among prostitutes. According to *Parent-Duchatelet*, tribadism begins only after prostitution has long been practised, between the twenty-fifth and the thirtieth year of life; generally there is a notable difference in age and also in beauty between the two women forming a tribadistic alliance, and as a rule the younger and prettier of the pair is the more passionately sensitive and the more constant. *Parent-Duchatelet* endeavours to explain the origin of tribadism by referring to the manner in which in brothels and reformatories the women are closely packed together, to the enforced abstinence from normal sexual intercourse (in prisons and reformatories), to the loathing for men sometimes felt by prostitutes, and to the opportunities for mutual observation of the most intimate nudities. Even women who at first object to it most vehemently, commonly give way to this vice after eighteen or twenty months.

Among 103 prostitutes examined by *Lombroso*, he found tribadism to be practiced by five. He considers the principal cause of tribadism to be in the lascivious search for new and unnatural pleasures, and

quotes in illustration the characteristic remark of Catharine II, herself a tribadist, "Why did not nature endow us with a sixth sense?" Female criminals who seduce others to the practice of tribadism have usually themselves acquired the vice during a long term of imprisonment—it is, in fact, the long-sentence criminals, women with a congenital inclination toward crime, that incline also to unnatural vice. The influence of environment is, according to *Lombroso*, indicated by the fact that the most confirmed criminals, in prisons for women, corrupt in this manner so many of the inmates who are merely "criminaloids," and corrupt even the wardresses. Further, he is led to conclude, the confinement in close association of so many extremely sensual and prostituted women, leads to the origin of a kind of ferment of new lascivious desires, and causes an increase of one form of degeneracy by means of another. Prostitutes often see one another naked, sleep two or three together in the same bed; similar things occur in boarding-schools. In asylums also we may observe that the admission of a tribadist will result in the infection of all the inmates with this vice.

According to *Moll's* estimate, 25 per cent. of the prostitutes of Berlin practice tribadism. According to the experience of this author, in cases in which tribadists live in concubinage, one of them is always a prostitute; the active and the passive rôle are always played by the same respective members of the alliance; the active member is called "papa" or "uncle," is usually a prostitute, and, like the man in the married state, possesses great comparative freedom in sexual matters, whilst the passive member, the "mother," is not allowed to form any sexual relations outside the concubinage.

According to *Riccardi*, many frigid prostitutes practice with pleasure clitoris-masturbation, cunnilictio, and, especially, sapphism, preferring these perversions to the normal sexual act. Moreover, among prostitutes and female criminals there is no lack of lovers of martyrization, of flagellation, even to the drawing of blood, of tyrannical treatment, and of the initiation of children into the mysteries of sex.

[For a detailed account of Sadism and Masochism, see *von Kraft-Ebing's* "Psychopathia Sexualis. These particular perversions, common in men, are rare in women; hence but passing allusion is made to them in the present work.]

Lombroso records on account of its rarity a case of masochism observed by him in a woman thirty-five years of age, who liked being whipped.

Moraglia reports a remarkable instance of sexual perversion in a girl of eighteen, who preferred to coitus, masturbation associated with the stimulating influence of the odor of male urine; this peculiar form of irritability was so powerful as to drive the girl to mastur-

bation in public urinals, notwithstanding the risk of arrest, which indeed often occurred.

According to *Carlier*, there are four or five brothels in Paris which are not infrequently visited by rich ladies in search of tribadistic enjoyments, and ladies of "high life" assemble there for communal orgies; it is noteworthy that prostitutes surrender themselves for such purposes to these women who are outside their own circle with great reluctance, and only for a very high fee.

Speaking generally, however, sexual perversion is rarer and less intense in women than in men. This fact is explained by *Lombroso* on the ground that the erotic element in women's nature is less active, and that women are less often affected by epilepsy, the principal source of these anomalies. In cases in which the genital organs are healthy we must, with *Westphal*, conclude, with reference to contrary sexual sensation, that the abnormal sexual feelings have a cortical origin.

From *von Maschka's* elaborate account of unnatural offences, in his *Handbook of Forensic Medicine*, we abstract the following passage relating to the female sex: "Lascivious procedures liable under certain circumstances to legal punishment may consist: 1. In handling or other manipulation of the genitals, without actual intercourse. If the genital organs of a female have merely been gently handled, without any more violent manipulations, we shall not, as a rule, either in the case of children or of adults, find any local changes as a result; contrariwise, if the handling has been rough and brutal, if the fingers have been forcibly thrust within the vulval cleft, or if the pudendum has been pulled and rent, we may expect to find excoriations, redness, swelling, laceration of the hymen, or even of the vagina and the perineum. 2. In licking the female genitals (cunnilingere). An analogous process also effected by members of the female sex, whether children or adults, is *irrumare, id est, penem in os arrigere; fellare, id est, vel labiis vel lingua perfricandi atque exsugendi officium penis præstare*. 3. In introduction of the membrum virile into the rectum, either of children or of adults, pæderasty. That this form of sexual gratification is not infrequently practiced upon women has been pointed out especially by *Parent-Duchatelet*, and is asserted by *von Maschka* from personal knowledge of cases in which it has occurred.

Tribadism and Lesbian love, unnatural vice practiced by two individuals of the female sex, occur, according to *von Maschka's* description in the following manner: *a.)* By masturbation, either one person gratifying the other by manipulation, or mutual masturbation. In a case of this kind recorded by *Tardieu*, a wife still young repeatedly, and by day as well as by night, introduced her

finger deeply into the vagina or the rectum of her little girl, moving it about there sometimes for as long as an hour. According to the child's account, the mother herself at these times was in a condition of excitement, no doubt sexual, which she gratified in this manner. In another case, several older girls engaged with their own fingers and tongues in lascivious practices with the genital organs of a little girl of seven. According to *Krausold*, among female prisoners such "forbidden friendships" are extremely common, formed for the purpose of mutual masturbation, and in connection with which the bitterest jealousy and the most ardent love are exhibited. *b.*) With the assistance of an enlarged clitoris, with which one woman performs the sexual act by introducing the organ within the vagina of another. In France in the nineteenth century a woman is said to have lived whose genital organs were so formed that, on the one hand, as a woman she played the passive part in intercourse with men, and, on the other hand, was able to give sexual gratification to women by assuming the active part of the male. *c.*) By the employment of an artificial *membrum virile*. This mode of obtaining satisfaction of sexual desire was known already to the ancients, and such a priapus was by the Greeks termed *ἄλισθος*. The fact that such articles are manufactured and sold, affords sufficient proof that their use is not unknown in our own day. *Von Maschka* describes such priapi as being made of india rubber, of the size and shape of an erect penis, perforated longitudinally and fitted at the lower end with a testicle-like attachment, to be filled with warm water or milk, so that by squeezing it an ejaculation can be counterfeited. This priapus is also so constructed that it can be attached to the body by means of a girdle and can thus be employed for the gratification of another individual.

We have already referred to sodomy, unnatural intercourse with the lower animals. *Von Maschka* gives several instances of this, which we have previously mentioned, and states also that some years before, during his stay in Paris, a female was accustomed to hold a secret exhibition, the entry to which cost ten francs, and at which she had sexual intercourse with a bulldog trained for the purpose.

According to *Lombroso*, even at the present day, the inmates of licensed brothels frequently hold exhibitions, for admission to which a fee is charged, of tribadistic couples in *poses plastiques*, and of another prostitute in *coitus caninus*.

In his widely-celebrated work on *Psychopathia Sexualis*, *von Kraft-Ebing* discusses these morbid sexual processes in women. We select certain data from his exposition. Regarding the congenital morbid phenomenon of the lack of sexual feeling in women,

as contrasted with perversion of sexual feeling, and the sexual impulse toward an individual of the same sex (antipathic sexual feeling), *von Krafft-Ebing* writes: "The woman-loving woman feels herself sexually to be a man, she rejoices in the exhibition of courage, of masculine sentiments, since these characteristics make the man desirable to the woman. The female *urning*,³⁵ therefore, likes to have her hair cut short and her clothes of a masculine cut; and one of her greatest pleasures is when opportunity offers to appear in male attire. Her ideals are notable feminine personalities, distinguished by spirituality and energy; in the theatre and in the circus, it is only the female performers that attract her interest; and in the same way, in collections of pictures and statues, it is only the representations of women that awaken her æsthetic sense and her sensibility." *Von Krafft-Ebing* insists that in nearly all cases of antipathic sexual feeling in which a family history was attainable, that history was found to exhibit instances of neuroses, psychoses, stigmata of degeneration, etc. In hysteria, according to this author, the sexual life is especially often abnormal; in cases with neuropathic inheritance, one may say always: "All possible anomalies of the sexual functions occur in such cases, with the utmost variety and the strangest commingling, based upon hereditary degenerative processes, and accompanied by moral imbecility in its most perverse manifestations. * * *. Frequently, in hysterical subjects, the sexual life is morbidly excitable. This excitement may be intermittent (? menstrual). Shameless prostitution may result, even in married women. In cases of a milder type, the sexual impulse is exhibited in the form of onanism, nude perambulations about the room, wearing of male attire, etc. In cases of hysterical mental disorder, the morbidly excited sexual life may manifest itself in the form of maniacal jealousy, baseless complaints against men of indecent assault, hallucinations of coitus, etc. Sometimes there may be frigidity, with lack of sexual pleasure, commonly due to genital anæsthesia."

Incest in women, dependent upon psychopathic causes, is also alluded to by *von Krafft-Ebing*; it occurs in those in whom a partial imbecility that leaves the sense of modesty undeveloped is combined with eroticism. Thus, a case reported by *Schiürmayer* is mentioned, in which a mother had, or attempted, intercourse with her son, aged five and one-half years; and again a case reported by *Lafarque*, in which a girl of seventeen laid her thirteen-year-old brother on herself for the gratification *conjunctionis membrorum*, while simul-

³⁵ This word *urning*, used to denote individuals exhibiting this particular type of homosexuality, belongs to the terminology now generally adopted by writers on sexual pathology, and has been used by English writers on the subject — Havelock Ellis, for instance.

taneously masturbating her brother; *Magnan's* case, an unmarried woman twenty-nine years of age, who could hardly resist the impulse toward copulation with her nephews as long as they were quite young; *Legrand's* cases, in one of which a girl fifteen years of age seduced her brother to the performance of all possible sexual excesses on her body; another, a married woman aged thirty-five, who committed incest with her eighteen-year-old brother; and a third, a mother aged thirty-nine, who committed incest with her son.

According to *Moll*, women who suffer from antipathic sexual sensation are, in many cases, married; it appears, however, that for the most part they have no inclination to marry. In isolated cases there may exist a psychical hermaphroditism, the woman thus affected having sexual inclination both towards men and towards women. In the case of homosexual women, normal intercourse appears not to furnish complete satisfaction. As regards fetichistic, masochistic, and sadistic inclinations on the part of women with antipathic sexual sensation, *Moll* was unable to obtain any trustworthy information. Sometimes in women the perverse sexual impulse appears periodically, being then often associated with the appearance of other psychical abnormalities. In some women the perverse impulse is especially active at the menstrual periods; whilst at other times these subjects, even though not quite sexually normal, are still very much quieter. Antipathic sexual sensation in women may depend upon inherited predisposition, and may often be traced back to a very early age. In many cases an exciting cause may be demonstrated.

Mantegazza, who relates that homosexual practices are common among the inmates of harems, believes that antipathic sexual feeling is readily curable in women soon after marriage, but that later a cure is rare.

A perverse form of sexual gratification sometimes met with in women is flagellation. By chastisement with birches, straps, or whips on the bare buttocks, the nerves of the sexual apparatus are stimulated, and these organs become congested, with an effect resembling that of onanism. Such flagellation was practiced by the wanton ladies of ancient Rome. In the Middle Ages, hysterical women derived great pleasure from the stimulatory effect of whippings. It is reported of Catharine de Medici, that she had herself whipped, and that she delighted in seeing the ladies of her court undergoing similar treatment. In the present day many women derive intense sexual pleasure from being birched by their lovers on bared portions of their bodies. In Paris and other large towns there are special places of resort for those who pursue this form of perverse sexual gratification. Sometimes such women are only the active *fouet-teuses* for worn-out, perversely-feeling men.

Among the Greeks, a woman who had remained barren during the early years of marriage would visit the temple of Juno, in order to receive from a priest of Pan the gift of fertility. She stripped naked, and, while thus exposed to the flagellant priests, she received all over the back of her body numerous blows inflicted with thongs of a he-goat's hide — this process being supposed to induce fertility. The object of this form of flagellation would appear to be to induce an increase of sexual desire.

Sexual neurasthenia is defined by *Eulenburg* as a neuropsychosis of chronic course, manifesting itself chiefly in the form of excessive irritability of the sensory and psychosensory neuron-systems, in association with excessive tendency to exhaustion of the motor and psychomotor neuron-systems. This exhaustion occurs especially in relation to the genital system, in which we see exhibited the phenomena of irritable weakness, of increased excitability combined with increased tendency to fatigue of the genital nerve apparatus — such chronic morbid disturbances are, according to this author, comparatively rare in women, that is to say, the developed typical picture of the disease does not occur in women, or occurs very rarely. Among 168 patients suffering from sexual neurasthenia, only six were women. Two of these latter were addicted to masturbation, and in the anatomical sense both were still virgins; the rest were married women, not receiving sufficient sexual gratification in their married life, two of these were probably also addicted to masturbation, two indulged in homosexual practices.

Onanism, according to *Eulenburg*, is the cause of sexual neurasthenia in women as well as in men. If, however, among the relatively very large number of women addicted to masturbation, there appears to be such a very small proportion of instances of sexual neurasthenia, this depends on the fact that from the nature of onanism in women the physical and also as a rule the psychical consequences are as a whole apt to be much less severe than those arising from similar practices in men; but it depends also on the circumstances that neuromental abnormalities of other kinds and denoted by other names, such as dyspareunia, vaginismus, sexual hysteria, nymphomania, feminine sadism, and tribadism, are apt to arise in consequence of onanism. As regards onanism, so also may it be in regard to sexual excesses and aberrations in general; they may be on the one hand causes, but on the other symptoms and sequelæ, of sexual neurasthenia. Early-acquired or inherited homosexual tendencies and habits may, as *Eulenburg* further points out, lead to sexual neurasthenia only, but then very easily, when such individuals have allowed themselves, against their nature but in obedience to conventional points of view and to the advice of the relatives, to be persuaded into marriage. That sexual abstinence alone is competent to induce sexual neurasthenia must be dismissed as a fable.

II. THE SEXUAL EPOCH OF THE MENACME.

By the term *menacme* I designate the culmination of the sexual development of woman, during which the processes of reproduction, copulation, conception, pregnancy, parturition, and lactation occur.

The processes of puberty in woman are fully completed at the age of from eighteen to twenty years, so that from this time forward she is fully equipped for the performance of her sexual duties. The first act in the fulfilment of these duties is copulation, which in civilized countries is in the great majority of women first undertaken at the commencement of married life. The average age at marriage in the women of this part of the world is 22; but marriages at an earlier age are very common, and in many circles of society the average age is as low as 20. The fullest maturity of sexual activity in women occurs, however, in the thirty-second year of life, this being the year in which on the average the maximum fertility is attained.

At the *menacme*, the beauty and energy of women attain their fullest evolution, her sexual characteristics their strongest development. It is this period of life, however, that entails the greatest dangers to beauty and health in connection with the functions of the genital organs. Copulation, the first act of sexual intercourse with the male, often produces in the female injuries from which she never completely recovers. Gonorrhœal infection has been a source of unspeakable miseries to women. Motherhood itself entails the risk of a great number and variety of illnesses, which, as puerperal sequelæ, affect this phase of woman's life. The struggle for existence, in which woman at her prime is also involved, and the fulfilment of duties to husband and children, further lead to the production of a series of changes, both physical and mental, in the feminine organism, which influence all the functions.

The great characteristic of this epoch is maternity. In maternity the fully developed woman lives and has her being, but to maternity also she often succumbs as a sacrifice to the fulfilment of her natural functions. Inasmuch as in this sexual phase the functions of the genital organs are of greater importance, to the same degree is enhanced the importance of the mutual relations between these organs and the other organs of the female body.

Another influence of fundamental importance in the sexually mature woman is that of the sexual impulse, the force of which is at times overwhelming, so that its gratification is sometimes sought without regard for the consequences to married and family life.

The physiology and pathology of the menacme coincides with the normal processes and pathological changes respectively of the female genital organs consequent on their functional activity as organs of sexual sensation and of reproduction. Woman as wife and mother stands at the climax of her existence.

In a quite astonishing manner, however, many of the advocates of the modern movement for the emancipation of women contest the significance of maternity to women.

A modern authoress and supporter of women's rights, *Ellen Key*, avows that she was in error when at an earlier date she "regarded maternity as the central point in woman's existence." She asserts that it lies within the sphere of a woman's individual rights, as of a man's, to reject marriage, or to accept marriage while rejecting maternity. "The grounds for the rejection of maternity may as well be deeply altruistic as deeply egoistic. It lies within the sphere of individual rights to dispense with love or with maternity when either is regarded or both are regarded from this point of view. It is entirely within a woman's rights to transform herself into a member of the 'third sex,' the sex of the worker bee, of the neuter ant, if she finds therein her greatest pleasure. * * * Women exist in whom erotic feeling is totally atrophied; there are yet others who fail to find in intercourse with the modern man that soulful and deep erotic harmony which they rightly desire; and there are others still more numerous who desire love, but not maternity, which indeed they dread."

A celebrated German authoress of the present day, *Gabriele Reuter*, refers in similar terms to the justifiable fear with which so many aspiring and hard-working women regard maternity, "the perpetual, watchful, emotional dread of motherhood, a dread which causes them to turn at bay. A dread, a hatred, it is, which has grown so strong, so active, that one might almost regard it as an obscure perverse instinct, awakened and developed and strengthened by bitter necessity. It is as if in the innermost recesses of their nature such women had a belief that should they pay their tribute to sex they would lose all the energy, clearness, and brightness of mind, by means of which they have raised themselves above the level of their sex. And perhaps women of a certain type are justified in this fear."

Fortunately, however, the woman who does not prize maternity still remains an exception. The great instinct for the preservation

THE SEXUAL LIFE OF WOMAN.

of the species, which nature has planted deeply in every human being, still as a rule in women remains much more powerful than the instinct of self-preservation at every one else's expense — more powerful than such self-sufficient egoism. And now as ever it is the duty of humanity to educate women for maternity from her youth upward, so that she is in every way fitted for the supreme duty of her sexual nature, the renewal of life from generation to generation.

Against the significance and importance of maternity to woman, the mountainous waves of the movement for the emancipation of women dash themselves as vainly as against the solid rock. Much justification may be found for the efforts of women in modern civilized communities to engage in departments of activity to which hitherto men only have been admitted; and as regards the intellectual capacity of women we may acknowledge their competence for the higher scientific professions; but while admitting this we must hold firmly to the physiological standpoint and must more especially bear in mind the sexual life of woman. Such professions only are suitable for a woman as do not entail a restriction of the sphere of her reproductive activity, a hindrance to her principal duty, that of maternity, an interference with the discharge of her obligations to husband and children, or a diminution of her domestic value and an evasion of her responsibilities in family life. As *L. von Stein* so justly remarks, the woman who spends the whole day at a desk, in the law courts, or in a house of assembly, may be a most honorable and most useful individual, but she is no longer a woman, she cannot be a wife, she cannot be a mother. In the condition of our society, the emancipation of woman is in its very nature the negation of marriage.

We may not agree with the great misogynist, *Schopenhaur*, in his depreciation of the female sex, or in his assertion that woman exists simply and solely for the propagation of the species, and that "her life should therefore flow more quietly, more inconspicuously, and more gently than that of man toward its goal;" nor need we regard as justified the severe sentence of the philosopher, *E. von Hartmann*, that from the moral standpoint, "the greater number of women pass the whole of their lives, in a state of minority, and, therefore, to the end stand in need of supervision and guidance;" but the statement made by *Friedr. Nietzsche* in his book *Also sprach Zarathustra* deserves acceptance, "Everything in woman is a riddle, and everything in woman has its answer: it is called pregnancy," and again, "For woman, man is only the means; the end is always the child."

Unsearchable in its judgments, nature has imposed on woman alone the consequences of the act of generation; man has the pleasure, but not the labor and the pain. We might indeed regard as highly

unjust the distribution of the rôles in the process of reproduction, were it not that in a mother's love and a mother's joys, woman finds a compensatory solace. The man's part is a much easier one and costs far less than that of woman; with the gratification of his sexual desire, man shakes off any further responsibility, whereas the woman's body becomes the workshop in the wonderful act of creation of a new human life.

Maternity, says *Lombroso*, is the characteristic function of the female sex, upon which rests her whole organic and physical variability, and this function is indeed throughout of an altruistic nature. Although there is a certain antagonism between the sexual impulse and maternity—according to *Icard*, the sexual impulse is extinguished in women during pregnancy,—still, maternity appears to depend upon sexual perceptions. For instance, the act of suckling the infant often arouses voluptuous sensations, and *Icard* mentions a case in which a woman permitted fertilization to occur solely on account of the pleasure obtained by suckling. The anatomical cause of this fact is to be found in the connections between the nipple and the uterus by way of the sympathetic nervous system. * * * It is likewise probable that in the happy feeling of maternity there intermingle very gentle voluptuous sensations derived from the genital organs. According to *Bain* also, very delicate sensations of contact form an element in maternal love.

The epoch of the menacme is that in which, independently of maternity, the sexual impulse often becomes so powerful in woman as to be entirely dominant. The problems relating to marriage and to the sexual position of woman, so widely discussed at the present day, are, therefore, of especial importance in regard to women at this period of life. The forcible repression and control of the sexual impulse inculcated by moral and religious ordinances are now, according to the modern leaders, both male and female, of the woman's movement, to be abandoned; and it is loudly asserted that every woman has the same right as man to physical love and the happiness it produces. Hence, free love is demanded. "Freedom in love, freedom for love—this is what the dignity of the human race demands," asserts the authoress of a book recently published (*Elisabetha von Steinborn, The Sexual Position of Woman*). With laws for the regulation of marriage, this section of the women's rights party will have nothing to do. A truly good and honorable man, they contend, has as little need of laws to regulate his amorous relations as he has of laws against murder and theft. In the first place, love, the sexual relation between man and woman, must be free, and humanity, freed from vexations and needless control, will then seek and find the proper path, even if at the expense of a few

errors by the way. Only after this unrestrained sexual intercourse has lasted for a long time, will free marriage become the rule. "Out of this phase will develop the monogamic system willed by God, for which, in its most ideal form, we are not yet sufficiently ripe." It is hardly necessary to discuss in detail the general deleterious influence of such unlimited, unregulated free love upon the community, upon human society as a whole, to describe the results of free love, to attempt to realize the chaos which it would bring about in the social relations of civilized humanity. We must rather

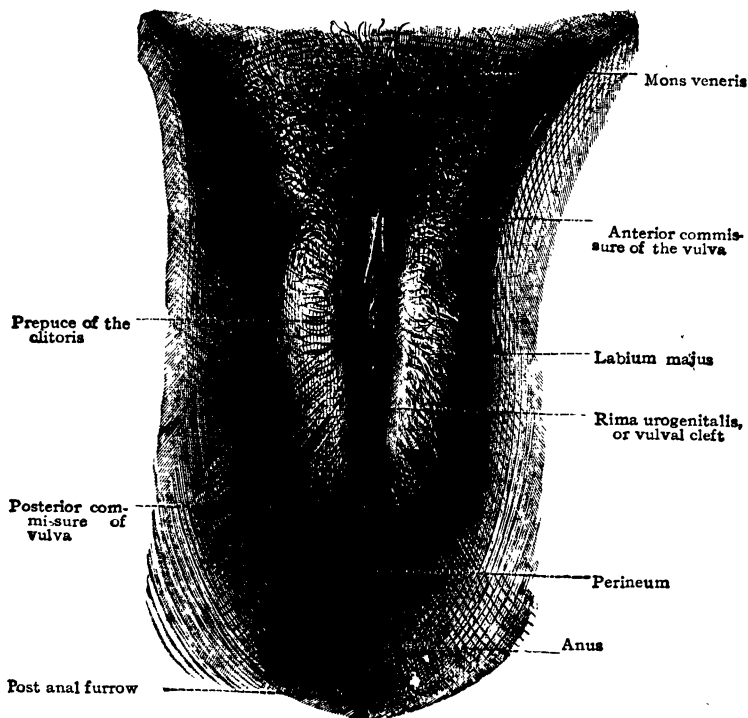


FIG. 48.— The female pudendum, or vulva, with the labia majora. The vulval cleft. Female perineum. Mons veneris, with the pubic hair. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

indicate it as desirable from the medical standpoint also, that such a change in general domestic economy shall be aimed at as will enable the great majority of women to share in married life and family happiness, and thus making allowance both for human nature and the demands of social life, to effect a true harmony between sexual morality and sexual practice.

We must point out that in so far as the modern woman's movement aims at dispensing with man and at basing the entire life of woman upon the independent ego, that movement is in opposition to nature and its eternal laws. A woman who thus seeks the solution of the woman's question in the direction of freedom and independence is one who endeavors to avoid the burthen of womanhood. She desires to escape, always from guardianship, often from maternity, and usually from the restrictions, the unselfishness of womanhood. But none the less does she remain unable to escape from her femininity.

"The true significance of woman," insists *Laura Marholm* in opposition to the modern tendency, "has at all times consisted rather in what she is than in what she performs, and it is precisely in

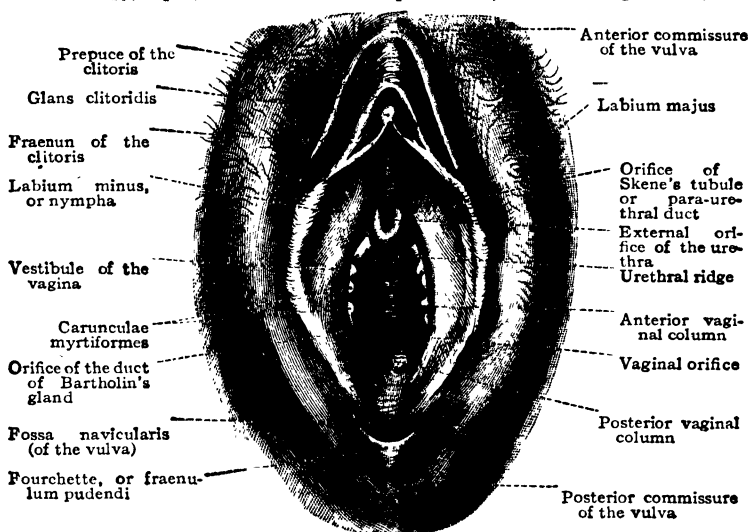


FIG. 49.—Vestibule of the vagina, with the labia minora or nymphæ, the vaginal and urethral orifices, and the glans clitoridis. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

the former point that the women of the present day seem so unusually wanting. Their performances are indeed many and various, they study and they write innumerable books, they are the directors or principals of all possible concerns and collect funds for every possible object, they wear doctors' gowns, conduct agitations, and found clubs, and they come continually more and more into publicity. And yet their public significance is after all diminished. The greater the influence of woman in the mass and as a numerical

majority, the less is her influence as an individual, the smaller is the triumph of her sex. She herself has induced man to sound the trumpet note of the abhorrence of women. *Tolstoi* in *The Kreuzer Sonata*, *Strindberg* in numerous dramas, *Huysmans* in *En Ménage*, write in this strain; and in the works of many lesser luminaries we encounter this mistrust of love. * * * The modern system of education for girls, with its polyglossia and polymathy, favors a superficial development of the understanding, and produces women who are pretentious without being profound."

Feminine beauty suffers during the menacme from the stress of the demands made on the sexual activity as well as on the functional capacity of the individual. Repeated, rapidly succeeding pregnancies and confinements impair the beauty of the breasts and the abdomen, the figure and the carriage. In consequence of suckling, the breasts, hitherto firm and elastic, usually become more or less pendent and wrinkled, sometimes also flabby and inelastic, sometimes nodular. Diseases of the genital organs and the disorders of the general health dependent thereon, leave disfiguring wrinkles in the face and other traces in the whole structure of the body. Toil, anxiety, and grief also write their horrible marks deeply on the appearance. The mature working-class woman, through sharing in masculine labors, through long-continued muscular exertion, and through neglect of bodily care, frequently assumes in her features, her carriage, her figure, and her whole appearance, a rather masculine type.

The beauty and the youthful freshness of girls belonging to the labouring classes seldom endure for long after the menarche, and in cases in which the environment is one of poverty, they last through a very short part only of the epoch of the menacme. The early appearance of wrinkles in the face, the stiff, angular character of the movements, the ungraceful carriage of the body, all these combine to make a woman of five-and-twenty who groans under the burthen of toil appear at the first glance an elderly woman, and a closer investigation shows what damage has been wrought to the attributes of beauty, how the breasts are flabby and flattened, the belly prominent, the buttocks pendulous, the arms muscular.

In the well-to-do classes, again, at this period of life, when generous diet combines with insufficient exercise, an abundant deposit of adipose tissue may already have occurred, resulting in a great impairment of beauty, the body and limbs being enlarged, the gait and the carriage correspondingly altered for the worse — changes which seem desirable only to those orientals to whom such obesity, such exaggeration of femininity, is sexually stimulating. If, however, this deposit of fat is not excessive, this it is which endows

women during these years of fullest development with an imposing appearance and buxom form. In favourable circumstances, beauty of this type may persist to the fortieth year of life and even beyond, and it is of such a character as to justify the proverb that woman's first sexual epoch is dedicated to love, her second to voluptuousness.

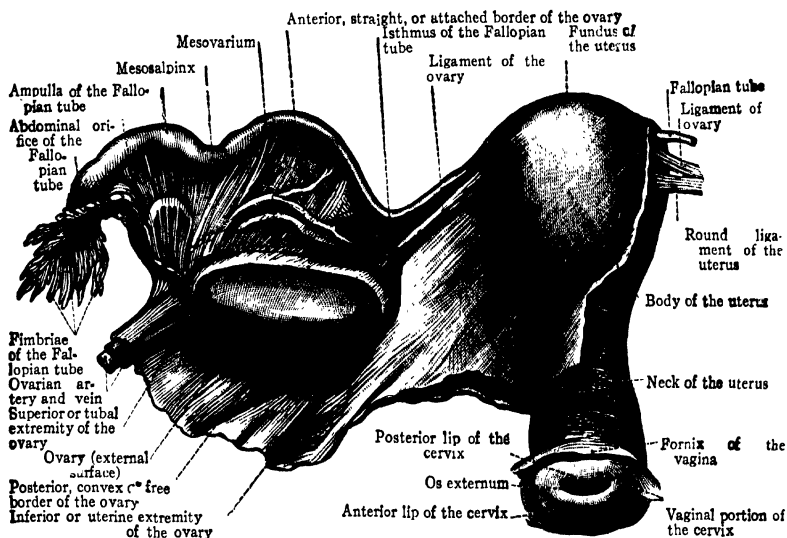


FIG. 50.—The uterus, the left Fallopian tube and the left ovary, in their connection with the broad ligament of the uterus, which has been fully unfolded. Seen from behind. From a virgin aged nineteen years. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

"Bountiful nature," writes *Mantegazza*, regarding woman at this sexual epoch, "sends to woman an ingenious engineer, who enlarges the hills to mountains and fills up the valleys with a soft alluvium of fat. The commencing wrinkles disappear, being smoothed out under the beneficial influence of this plastic material; the slender, elastic palm-tree stems are converted into majestic columns of Parian marble; quality is replaced by quantity, and if the eye has lost a few provinces, the hand has gained just as many. * * * A certain number of chosen women understand how to preserve for as long as ten years the unstable equilibrium of the period which separates these two ages of life. There are divine beings who with every oscillation of their tresses or rocking of their hips, with every undulation of their bosom, every serpentine movement of their limbs, instil desire. * * * They constitute our most intense

delight, and our intensest torment, they make our life a blessing or a curse, they are the uttermost goal of human passion, of human voluptuous desire."

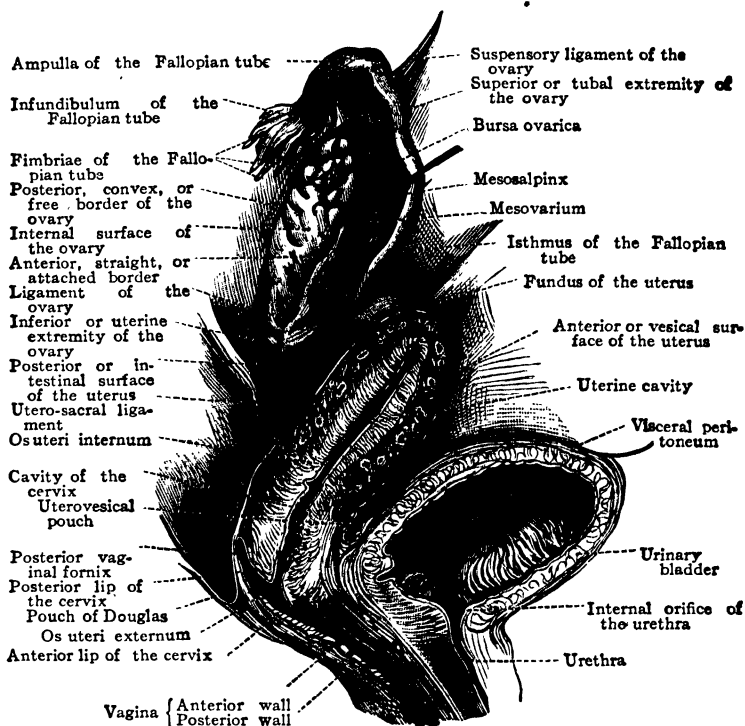


FIG. 51.—Female internal genital organs in the fully developed state. (From Toldt: Atlas of Human Anatomy.—Rebman Company, New York.)

Among the injuries to beauty effected by pregnancy, one above all evident to the eye is the almost invariably ensuing change in the skin, principally taking the form of a change in pigmentation, with the appearance of spots varying in size and tint, on the face and especially on the lips and the forehead; there is greatly increased pigmentation also of the areola mammae and the linea alba, and in addition of the labia majora and minora and of the anal region. It is not certain whether this chloasma uterinum is dependent, as *Jeamin* assumes, on the discontinuance of menstruation, or, as *Virchow* believes, on changes in the blood and the blood-pressure. Sometimes also, in pregnant women, we observe on the face, chiefly on

the nose and the cheeks, dilatations of the small cutaneous vessels, often associated with acne nodules.

A permanent disfigurement is caused by the *lineæ* (vel *striæ*) *albicantes*, white lines or streaks of varying length and resembling scar tissue in appearance on the skin of the abdomen, the adjoining parts of the buttocks and thighs, the lower part of the front of the thorax, and the mammæ. They are not true scars, not being new formations of connective tissue, being on the contrary dependent on solutions of continuity, on relative diminution, that is to say, of the connective tissue layer of the skin. They are formed in consequence of the fact that the connective tissue bundles are not able to keep pace in their superficial enlargement with the necessarily rapid extension of the cutis, hence great meshes appear in the former, situate in the direction of the greatest tension of the skin. (*Spietshka* and *Grünfeld*).

Transiently during pregnancy, but in some cases permanently also, the beauty of the lower extremities is apt to be impaired by enlargements of the veins, the formation of varices, and sometimes also by œdema; these conditions depend upon the hindrance to the venous return caused by the pressure of the pregnant uterus. Thick, vermicular, bluish strings or nodular enlargements appear in the course of the great veins, with consequent eczema and ulceration. In pregnant woman, eczema is common in other regions, on the face, the hands, the forearms, and the genitals; also erythema, urticaria, and the pustular eruption known as impetigo herpetiformis.

Parturition and lactation entail further disfigurement of the skin through the production of various lesions, such as cracks and fissures of the skin of the breast, dermatitis due to venous thrombosis in the lower extremities, scarring of the breast after mastitis, etc.

In the description of the sexual life of woman in the epoch of the menacme, we shall consider at some length copulation and conception, the relations of fertility and sterility, the important topic of the use of measures for the prevention of pregnancy, and the interesting subject of the determination of sex; on the other hand, pregnancy, parturition, and the puerperal state, since these subjects are specially treated in the ordinary text-books on midwifery, we shall discuss only in so far as certain relations between these reproductive processes and the organism as a whole and its functions, appear to us especially worthy of note.

ANATOMICAL CHANGES IN THE FEMALE GENITAL ORGANS IN THE PERIOD OF THE MENACME.

In the fully-developed woman during the period of the menacme, the mons Veneris forms a rounded elevation which consists of very

dense connective tissue containing large quantities of fat, while the integument that covers it is usually coated with a thick growth of hair. The form of this hairy covering, which by the Roman poets was designated *Hebe*, by the Greeks *zunaikomustax* (translated by *Albrecht Dürer* as *Weybsbart* — woman's beard), by *Galen* termed *ornamentum loci*, is various, and, as an external sexual character, it deserves more accurate observation than it has hitherto received from anatomists.

The hairy covering of the female genital organs is in adults, and especially in brunettes, very abundant; above, it is usually sharply limited by a transverse line across the top of the mons Veneris, and it extends outwards only a little beyond the labia majora, whilst below it extends only to about the middle of the sides of the perineum. According to *Bergh*, however, who made an exact study of this matter in 2,200 women of ages for the most part between fourteen and thirty years, in some cases the shape of the patch of hair (which is in such instances always very thick) resembles that so common in the male, there being a pointed process, usually rather narrow, extending upward toward the navel. This masculine form of the pubic hair is by no means common in women; according to *Lombroso* it is met with more frequently in Italian women than in those belonging to other European nations. In most women, the thick hairy covering of the mons Veneris is sharply limited above by the curved line that indicates the upper margin of the eminence, whereas in men a strip of hair usually passes up from the mons pubis to the umbilicus. Still, exceptions are met with. Thus, in 100 women, *Schultze* found five in whom the hairy covering extended up to the navel. Sometimes other variations occur, for instance, the hair may extend laterally into the groin, occasionally as far as the anterior superior spine of the ilium, and across the upper part of the front of the thigh, not infrequently in association with a thick growth of hair along the sides of the perineum as far as the anus. Of women with the hair growing in this fashion, not a few appeared to *Bergh* to have unusually strong sexual passion.

In contradistinction to these cases in which the development of the pubic hair is thick and even excessive, we meet with others in which it is very scanty, and this not only in quite young individuals (at an age from 15 to 18 years), with but slight development of the labia, but also in older and fully developed women — for the most part blondes.

The growth of the pubic hair is thickest and strongest near the median line, whilst laterally the hairy covering is thinner and weaker. The thickness is extremely variable. "In some women we find a flattened, occasionally frizzled, turf-like covering; in others,

a dense, elevated, luxuriant bush of hair" (*Bergh*). The length of the pubic hair is variable, but as a rule it is somewhat shorter in the female than in the male. Still, cases have been known in women in which it reached to the knees.

The colour of the pubic hair commonly resembles that of the hair of the head, but the pubic hair is usually the darker of the two. Blondes with dark or black eyebrows have, according to *Bergh*, usually dark or black pubic hair. The pubic hair turns grey late in life, later as a rule than the hair of any other part, a fact known already to *Aristotle*; it is rather late in life also that the pubic hair becomes thin, and in this state it remains almost invariably up to an advanced age, even when the scalp has become almost or quite bald.

The pubic hair, according to the same author, is seldom straight, being almost always curly, frizzled, or more or less rolled up into rings or spirals, generally forming smaller or larger locks. Fairly often, we meet with curled locks, either one pair or two, symmetrically disposed on either side of the depression adjoining the præputium clitoridis; these usually have an outward direction. Much more rarely we find similar locks symmetrically attached further back on the labia.

In the case of 1,000 adult women examined by *Eggel* with regard to the colour of the pubic hair, the colour of the eyes, and the colour of the hair of the head, there were 239 with dark eyes, 333 with dark hair on the head, and 329 with dark pubic hair; contrariwise, 761 had light eyes, 667 light hair on the head, and 679 light pubic hair. Obviously, then, a considerable number of women with light-coloured eyes must have had dark pubic hair. *Rothe*, in 1,000 North German women examined by him, found the pubic hair blonde, but a rather dark blonde, in a large majority of the cases; in red-haired women, the pubic hair was in all cases bright red, in black-haired women the pubic hair was black in two-thirds only of the cases, in nearly a third it was brown, in two cases dark blonde; in Jewesses, in a large majority of instances, the pubic hair is brown. The arrangement of the pubic hair is described by *Rothe* as very variable. "Sometimes it is short and frizzly, sometimes a luxuriant bushy growth; sometimes the hairs are scanty and thinly set; sometimes they are irregularly distributed; sometimes we see only a narrow strip of long hairs down the middle of the mons Veneris, which is bare at the sides. In some the lateral boundaries of the pubic hair are sharply defined, in others the hairy covering spreads beyond the usual limits."

Among the ancient Greeks and Romans, it was customary for women to remove the pubic hair, a custom even now observed by all oriental races; for this reason in ancient art the nude female body

is depicted without pubic hair. According to *Stratz*, in the *Chansons de Bilitis* it is said of the priestesses of Astarte: "They never draw their hairs out, in order that the dark triangle of the goddess shall represent on their bodies the form of a temple."

The physiological purpose of the pubic hair is to prevent irritation of the genital organs by the sweat that would otherwise run down upon them, and to protect the skin from direct friction during the act of copulation.

The labia majora in women during the menacme are usually strongly developed, their outer surface is hairy; in parous women we almost invariably observe small or even large lacerations of the frænulum pudendi or fourchette, in front of the posterior commissure of the vulva. On the inner surface also of the labia majora, the general characters of which are those of mucous membrane rather than of skin, fine hairs are also to be found. In multiparæ, and even in women who have frequently had sexual intercourse, these inner surfaces of the labia majora are not usually any longer in mutual contact, so that the rima urogenitalis or vulval cleft gapes more or less. In well-nourished women who have led the "sheltered life," the dense and fat-containing connective tissue of the labia majora (continuous with and similar to that of the mons Veneris) gives these structures a certain firmness and elasticity, and the labia minora or nymphæ do not project beyond them. But when the genital organs are not well preserved, projection of the nymphæ occurs. In women whose genital organs are beautifully formed, the nymphæ are of a soft, delicate consistency, and their mucous membrane is of a pink color; but when the reproductive organs have been subjected to excessive stimulation, the nymphæ are dry, hard, brown in color, and they project from the vulval cleft. In women of the Hottentot and Bosjesman races, the nymphæ attain, as is well known, an excessive length, forming the so-called "Hottentot-apron;" and in certain other indigenous races of Africa, the enormous size of these organs renders resection necessary.

During this sexual epoch, in women with strong sexual passion and having frequent sexual intercourse, the clitoris is largely developed, and sometimes the dorsum of the organ protrudes from between the anterior extremities of the labia majora.

The vaginal orifice gapes a little, so that the irregular carunculæ myrtiformes are visible. In parous women, the vaginal orifice is enlarged in such a manner that the wall of the vagina passes directly and without limitation into the wall of the vestibule, and the external orifice (meatus) of the urethra is situate immediately in front of the anterior vaginal column, and thus lies within the vaginal orifice.

The breasts of a strong, healthy woman who has attained complete sexual maturity are more or less firm in consistency, and considerable in size, exceeding now *Ovid's* demand concerning these organs, *ut sit quod capiat nostra tegatque manus*. The normal hemispherical form and the somewhat soft texture are subject to many variations, these being dependent upon race, climate, and sexual activity and also upon the kind of clothing worn. The nipple and its encircling areola are usually of a brownish colour; but in beautiful women they sometimes retain the pink colour characteristic of these structures in the virgin. In parous women who have suckled their children, the breasts are usually pendent, and often the left breast will be found to be somewhat larger than the other; generally also in such women the nipples are longer and thicker than normal. Not infrequently the nipples are withdrawn into a furrow of the skin, and become prominent only on local stimulation or as a result of sexual excitement. Sometimes in the region of the areola, especially in brunettes, we see a circle of small glands, which produce eminences beneath the skin.

It is easy to understand that the breasts of such women in general no longer have the virginal form of small hemispheres, but have matured to a greater fulness and size. This, however, does not diminish their beauty, for the ideal of beauty must take into account the natural development of the body. Whereas at the present time, under the influence of the modern negation or at any rate undervaluation of maternity as the goal of woman's life, it is the tendency of a certain school of art to misprize the influence of that state on the form of the breast, and to esteem the "flat bosom," at an earlier day under the influence of *Rousseau's Emile*, a book in which mothers are strongly urged to suckle their own children, the full bosom as a beauty was the fashion in art.

Only a perverted taste can find a woman beautiful without bosom—without "that golden chalice, from which men quaff love, and children life" (*Mantegazza*),—an angular, flat being, without a rounded form. Nothing but a morbid desire for equality with man can induce woman herself to endeavor to conceal also the external manifestation of her sexual characteristics, and by her clothing to disguise, like a nun, the sexual curves of her figure.

Great deposit of fat, such as occurs from liberal feeding in conjunction with a sedentary mode of life, or as a result of several pregnancies, destroys the beautiful form of the breasts, which attain an immoderate size, thus disturbing the grace and symmetry of the feminine figure, a fact recognized already by the Romans. *Hyrtl* condemns, from the point of view of anatomical beauty, the nude female figures in the pictures of *Rubens*, remarking that "the god-

desses and angels of this painter are as luxuriant in their development as a Flemish dairy-maid;" and the buxom "goat's-udder breast" prized by the Arabs does not represent any nobler ideal of beauty. Sometimes these excessively large and fat breasts hang down in a conical form, or, as more or less flattened hemispheres, reach right down over the gastric region; moreover, the interspace between the two breasts seems to disappear, and they touch or rub against one another.

According to *Ploss* and *Bartels*, the various forms of breast occurring in different races may be classified as follows: A. According to size: 1, very large; 2, large; 3, medium; 4, small. B. According to consistency and firmness: 1, high; 2, semi-pendent; 3, pendent. C. According to shape: 1, shell-shaped (disc-shaped); 2, hemispherical; 3, conical. The nipples also, according to these authors, exhibit variations dependent upon race, being in some cases small and flat, like a little knob, in some cases large and conical in shape, with a broad base and a rounded extremity, and in some cases large and cylindrical, having almost the shape of a finger-joint. The areola, finally, is in some women quite pale in color, in some dark pink, in some brown and even almost black from excess of pigment.

The uterus of a woman who has attained complete sexual maturity, has undergone such alterations in its proportions that the cervix and the body are of almost the same length. The constriction, visible externally, indicating the separation between these two segments of the organ, is depressed somewhat toward the external os. In sexually active women, a widening and an increased curvature of the region of the fundus occur, the uterine extremities of the Fallopian tubes becoming more widely separated; at the same time the posterior wall becomes more and more convex. The more frequently the uterus has functioned as a reproductive organ, the more strongly marked is the convexity of the body of that organ. The relative lengths of the corporal and cervical portions of the uterine cavity are now the reverse of those that obtain in the uterus of the child; the transverse and antero-posterior diameters have greatly increased. Transverse diameter at the fundus; virgin, 4 centimetres (1.575"), multipara, 5.5-6.5 centimetres (2.165-2.559"): sagittal (antero-posterior) diameter; virgin, 2 centimetres (0.787"); multipara, 3-3.5 centimetres (1.181-1.378"). (*Chrobak* and *von Rosthorn*.)

During the menacme, in consequence of the act of reproduction, the uterus undergoes important changes in form. In a nulliparous married woman, the uterus differs little from that of a virgin; the cavity is somewhat more extensive, the convexity of the outer surface a little greater, there is some increase in width in the neighbor-

hood of the fundus, the plicæ palmatæ (*arbor vitæ uterinum*) are confined to the cervical canal; further, under the influence of copulation the appearance of the vagina changes, it becomes larger, and its walls become smoother, sometimes quite smooth, from the disappearance of the rugæ of the mucous membrane and especially of those attached to the posterior vaginal column. Much more extensive are the alterations in the uterus of a multipara. According to *Toldt*, "the parts of the cavity representing the cornua, which are pointed on either side as they pass toward the Fallopian tubes, become completely included in the lower undivided portion of the cavity, this change being effected chiefly by means of the increasing outward curvature of the walls, so that the cavity comes to assume an amygdaloid form; the cervical canal is also enlarged, especially the lower part, where also the plicæ palmatæ (*arbor vitæ uterinum*) becomes less distinct; the vaginal portion of the cervix is shortened, the os uteri externum gapes, the lips of the cervix are tumid, nearly equal in length, and usually beset with scarred depressions." In nulliparæ, the vaginal portion of the cervix is, as in a virgin, of a rather tough consistency, smooth on the surface, while the external os is small, like a dimple, or transversely oval; the color of the vaginal portion of the cervix is identical with that of the vaginal mucous membrane in general. Through frequent copulation, however, the form of the vaginal portion of the cervix is so far altered inasmuch as it is more freely supplied with blood, and, therefore, changes slightly, in consistency. In multiparæ, in consequence of lacerations of the cervix, the os uteri externum changes to a wide transverse fissure with tumid margins, justifying the old designation of this orifice as *os tincæ*, carp's mouth. A large size of the external and internal os, moderate enlargement of the cavity, rounding of the upper angles adjacent to the uterine orifices of the Fallopian tubes, increased convexity of the walls, and partial or complete effacement of the plicæ palmatæ (*arbor vitæ uterinum*), are the characteristics of the uterus of a multipara (*Chrobak* and *von Rosthorn*). According to *Hennig*, the vaginal portion of the cervix is longest in women who have undergone defloration, and in nulliparæ; widest in prostitutes; narrowest in childless wives; thickest in young widows. This author gives the following measurements of the external os, showing its variations in accordance with age and sexual activity:

In childhood, transversely oval.....	0.46—0.56 cm.	(0.18—0.22")
In the virgin, rounded.....	0.20—0.50 cm.	(0.08—0.20")
In prostitutes, transversely, oval.....	0.60—2.50 cm.	(0.24—0.98")
In sterile married women, round.....	0.16 cm.	(0.06")
In parous married women, transverse fissure	1.10 cm.	(0.43")
After the menopause	0.81 cm.	(0.32")

In the fully-developed woman, the ovaries undergo changes in size, shape, and consistency, these changes being dependent upon the age, the sexual functional activity, and the constitutional predispositions of the individual. The average length of the ovary is 3-4 centimetres (1.18-1.58"); the average width, 2-3 centimetres (0.79-1.18"); and the average thickness 1 centimetre (0.39"). The surface of this organ gradually assumes a ragged appearance, from the scarred depressions caused by the great number of successive menstruations (ovulations)—sometimes the appearance produced resembles that of a mulberry.

In the vagina at this sexual epoch, the surface of the anterior and posterior vaginal walls is rendered uneven and rugose by well-developed vaginal columns (*columnæ rugarum*), which feel almost as hard as cartilage, and project considerably above the general level of the wall; the transverse ridges (*rugæ*) run horizontally outward from the columns. By frequent copulation, the *rugæ* are partially effaced, and the columns themselves become flatter and softer; still, except in cases in which the genital functions are exercised to great excess, the vagina remains tense and rugose until after several children have been born, when it becomes soft, flaccid, and smooth. Even in women who have been accustomed to frequent intercourse, the narrowest portion of the vagina is still the orifice and the part of the passage lying immediately within the orifice, which can be constricted by the levator ani muscle; childbirth, however, brings about great and permanent distension of these parts also. The widest and most distensible portion of the vagina is the uppermost segment, the region of the fornices.

A special significance must be attached to the glands of the cervix uteri, which, according to my own observations, have the function of providing a secretion that increases the mobility of the spermatozoa, and this enables them more readily to find their way into the uterus. I have endeavored, by a series of histological observations, to determine the properties of these glands and the changes they undergo in the different phases of sexual life. The most important results of these researches may be stated as follows. These glands, which are lined with columnar ciliated epithelium, are but slightly developed before puberty, being then simple excavations; at the time of the menarche, they become tubular; later, during the menacme, they become long, dendriform, blind-ending glands, which during menstruation and under the influence of sexual excitement, furnish a secretion, variable in quantity, and in quality distinguished especially by its alkaline reaction; further, in connection with a number of pathological disorders of the female genital organs, these glands undergo various changes both in their anatomical structure and in their secretory activity. At the time of the menopause and

after the climacteric age, these glands, which have hitherto consisted of branched tubules, tend to undergo cystic degeneration,



FIG. 52.—Sagittal section through the cervix uteri of a woman 26 years of age. dendriform branched glands.

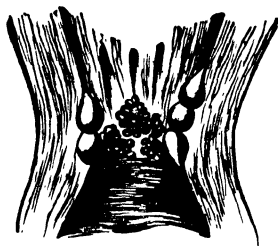


FIG. 53.—Cervix of a woman 72 years of age, with glands that have undergone cystic degeneration.

leading to the formation of the vesicles known as *ovula Nabothi*. After the climacteric, the existence of these cysts may be regarded as a normal occurrence; and, sometimes arranged in grape-like clusters, they often project so as to occupy the greater part of the lumen of the cervical canal.



FIG. 54.—Sagittal section through the cervix uteri of a woman 65 years of age. The glands have undergone cystic degeneration.

Diseases of the uterine mucous membrane during the period of sexual maturity often induce various pathological changes in these cervical glands. In consequence of obstruction of their excretory

ducts, they may undergo cystic degeneration, forming follicles filled with mucus and epithelium, or cavities containing blood, which pass through the substance of the cervix in every direction; or they may give rise to the formation of slowly-growing glandular polypi and other glandular new formations—changes the general result of all of which is to interfere with the secretory function of the glands.

PATHOLOGY OF THE MENACME.

The full evolution of the sexual life brings in its train many dangers to a woman's life. This appears at first sight from a comparison of the mortality of married women during the period of greatest sexual activity with that of single women of similar age. Between the ages of 20 and 25 years, the mortality of married women is in all races higher than that of unmarried women; and the same is true between the ages of 25 and 30 years, except in France, in which country from artificial causes maternity ceases at a very early age. In Prussia, in the year 1880, of every 10,000 married women, between the ages named, 21 died, of every 10,000 unmarried women, only 2. In Holland, Belgium, and Bavaria, this excess in the mortality of married women continues up to the age of 40 years; whilst in Prussia, from the age of 30 upward, the mortality of married women and unmarried is practically the same. In many countries, the mortality of married women at many ages exceeds even that of unmarried men.

This greater comparative mortality of married women is ascribed by *Hegar* to the satisfaction of the sexual impulse, and this authority believes that the dangers attendant on this function would be manifested yet more clearly if the contrast were made, not between married women and single, but between those habituated to sexual indulgence and those who are continent. We, however, are of opinion, that the satisfaction of the sexual impulse is only harmful to this extent, that it exposes women to the consequences of venereal infection, and also to the risk of numerous puerperal and other diseases of the genital organs. This is proved also by the statistical results of the investigations concerning mortality during pregnancy, parturition, and the puerperium. According to *Hegar*, adding deaths resulting from premature delivery to deaths resulting from delivery at full term, we find the mortality of childbirth in Germany to be about 0.6 per cent.

Whilst *Bertillon* and *Simpson* believe that the lower mortality of married women above forty years of age as compared with unmarried women at the same period of life is dependent upon the advantage to the former of the fulfilment of sexual functions, *Hegar*, on the contrary, gives another explanation. He writes: "At the

age of 40, the less powerful married women have already been weeded out. At first, owing to the selection exercised by marriage, the quality of the unmarried women was inferior to that of the married women; the former, however, have not been exposed to the dangers attendant on the reproductive process, and so have passed through the time during which the body possesses the greatest elasticity; but in the years in which a decline in the vital powers naturally sets in, the originally inferior quality of the unmarried women is manifested by a comparatively higher mortality. Also we have to take into account among the unmarried, the consequences of extra-marital sexual intercourse and of prostitution, and further the lack of a family, of the support furnished by husband and children."

In addition to the far-reaching disturbances of health dependent on sexual activity at this period of life, there are the minor domestic troubles by which woman is depressed and by which her powers are exhausted. The influence of these latter is admirably described by *G. von Amyntor*: "How many millions of brave house-wives boil and scrub away their vital energy, their rosy cheeks, their merry dimples, in the performance of their household duties, until they become wrinkled, worn-out, dried-up mummies. The ever-renewed question, 'what must be cooked for dinner to-day,' the perpetually recurring necessity for scouring and sweeping and dusting and washing-up—these are the continual dropping which slowly but surely wears away soul and body. * * * On the flaming altar on which the sauce-pan simmers, youth and simplicity, beauty and good temper, are offered up; and who can recognize in the old, hollow-eyed cook whose back is bent with toil and trouble, the once blooming, energetic, chastely coquettish bride adorned with her myrtle crown?"

A great number of the diseases of the female genital organs occurring at the epoch of the menacme need only a passing mention. Even coitus, in cases in which there is great disproportion in size between the penis and the vaginal orifice, or when the organ is very rapidly introduced or the act is very roughly performed, may lead to injury to the vulva or the vagina, a fact to which a very large number of recorded cases bears witness.

During the acme of the sexual life of woman, disturbances of the menstrual function are also frequent. Menstruation may cease in consequence of intercurrent diseases or constitutional anomalies; amenorrhœa may occur during the convalescence from acute diseases, in obese women, in those suffering from tuberculosis, diabetes, alcoholism, or psychoses. On the other hand, severe menorrhagia or atypical metrorrhagia may occur, the bleeding either being due to diseases of the uterus, such as endometritis, retroflexion of the

uterus, or uterine myomata, or resulting from infectious diseases, disease of the heart or kidney, or from general disturbance of the health by chill or over-exertion. Or, again, dysmenorrhœa may arise, either as a symptom of some local uterine disease or in consequence of external noxious influences or weakness of the nervous system.

During the life-epoch of the menacme, moreover, disturbances of the nutrition of the uterus are of common occurrence, as, for example, hyperplastic processes in the mucous membrane of the cervical canal and of the cavity of the body of the uterus. Common also during the menacme is chronic oöphoritis, which may be due to mal-regulation of marital intercourse (especially to coitus too soon after childbirth), to carelessness during menstruation (dancing, skating, or mountaineering), to incomplete coitus (*congressus interruptus*), and not infrequently, to gonococcal infection; or, finally, the oöphoritis may occur soon after the puerperium in association with subinvolution of the uterus.

Next we may mention inflammatory diseases of the Fallopian tubes. In the etiology of these diseases in latter-day marriage, a dominant rôle must be assigned to the gonococcus; but they also arise in many cases from nutritive disturbances, infection (other than gonorrhœal), and indiscretions during menstruation. Pelvic peritonitis owns similar causation.

In this phase of women's life, the commonest new growths of the uterus, myomata, also develop, most commonly between the ages of thirty-six and forty-five, and they occur in strikingly larger proportion in unmarried women; it is between the same ages also that cysto-adenomata of the ovaries are of commonest occurrence.

Sexual intercourse gives frequent opportunities for the introduction of infective germs into the vagina, and for the origination of inflammatory affections of the mucous membrane (*colpitis*), the intensity of which depends upon the species, the quantity, and the virulence of the germs in question, on the one hand, and upon the local and constitutional predisposition of the infected person, upon the other. Especially grave in its consequences is gonorrhœal infection transmitted by the male, for this virus gives rise to a great variety of pathological processes in the female genital organs. In the act of defloration, considerable injuries are sometimes produced, and these readily supply a breach for the invasion of infective organisms. The condition of passive hyperæmia that occurs in the genital organs during pregnancy also provides a favorable soil for their growth.

Gonorrhœal infection of young married women is so frequent and so serious an occurrence in the sexual life of woman, that it requires special consideration. The cases in which the man entering upon

marriage is so unscrupulous and so brutal as to deflower his young wife and to continue copulating with her, while suffering himself from a quite recent and active gonorrhœa, are on the whole rare. More common is it for the bridegroom to believe himself completely cured of his previous claps, and he is declared cured by his physician. The disease is, however, latent merely, the gonorrhœa has become chronic, the discharge is so slight that it is overlooked; but by the stimulation of the frequent acts of coition usual in the early days of marriage, the disease is lighted up afresh, the gonococci multiply quickly and intensely, the young wife is infected, and suffers from an acute gonorrhœa, which may often escape observation for a considerable period.

In a gonorrhœal marriage, one in which both husband and wife have gonococci in their genital organs, very diverse phenomena may be observed and very various conditions may result. On this subject *M. Runge* writes: "If the husband's gonorrhœa is not cured, fresh, virulent cocci are repeatedly transmitted to the wife, in whom, therefore, the disease often gets worse by distinct stages. If the wife undergoes treatment, the effect in these circumstances will naturally be nil, since the husband is always supplying fresh infection. On the other hand, the wife on her side returns the gonococci to her husband, and in this way his gonorrhœa may undergo aggravation. If the husband is compelled, by illness, for instance, or by absence, to abstain for a long period from intercourse with his wife, the latter's gonorrhœa may, in favorable circumstances, undergo alleviation and cure. It may happen, however, that in the husband, in consequence of sexual rest, the gonorrhœa becomes latent, and even entirely disappears, whilst the wife still suffers from infection. If now, after long abstinence, the husband has renewed intercourse with his wife, he may be reinfected, and suffer from an acute attack of gonorrhœa, though this is due to the descendants of the very gonococci that he himself sometime before conveyed to the genital organs of his wife—he reinfected himself, as people say. Such cases have given rise to suspicions of unchastity on the part of the wife, when the husband is in actual fact enjoying his own work in a new edition. A further possibility is that both husband and wife have become habituated to their own gonococcal interchange; that is to say, the organisms produce no notable effect in either. But if the wife in such a condition receives the embraces of a lover, the latter may be infected with an acute gonorrhœa—a fact that has long been known."

The principal rôle in the etiology of the diseases of the female genital organs must be assigned to pregnancy and childbirth. Anæmic women readily suffer during pregnancy from a further decrease

in the corpuscular richness of the blood; those affected with valvular incompetence find their troubles much aggravated by pregnancy; where the kidneys are in an irritable condition, pregnancy not infrequently results in the onset of nephritis; those with disordered digestion often suffer from increased disturbance of the functions of the stomach and the intestinal tract; those with gall-stones are apt to suffer from exceptionally severe attacks of biliary colic, and acute yellow atrophy of the liver is especially apt to occur during pregnancy. In women in whom dilatations of the veins already exist, very great increase of the enlargement is apt to occur during pregnancy; and in the same circumstances, trifling teleangiectases increase to extensive angiomas. Enlargements of the thyroid body undergo rapid increase during pregnancy, so that they may attain threatening proportions. In women in whom the abdominal walls are flaccid, the viscera may protrude during pregnancy through the enlarged lacunæ, giving rise to herniæ. The great relaxation of the peritoneal and other ligamentous attachments of the great abdominal glands, occurring during pregnancy and the puerperium results in displacements of these organs; hepatoptosis (migrating or movable liver), lienoptosis (splenoptosis or wandering spleen), nephroptosis (ren mobile, floating or movable kidney), and other varieties of enteroptosis (splanchoptosis, visceroptosis, or Glénard's disease). During pregnancy, previously sound teeth are apt to become carious, and already existing caries rapidly advances. New growths of various kinds originate at this period, those previously present exhibit rapid increase; and relapse after operations for the extirpation of malignant tumors is especially apt to occur. Even the bones are unfavorably influenced. A weakened nervous system is subject to a storm of changing nervous troubles, in some cases so severe as to lead to the outbreak of actual psychoses; while mental disorder already present tends, as a rule, to be seriously aggravated during pregnancy. In the eyes, serious disorders may occur, such as retinitis, and atrophy of the choroid with complete amaurosis. As regards the hearing, tinnitus aurium is not uncommon, and sometimes complete deafness occurs. Numerous diseases of the skin are apt to occur during pregnancy; in addition to the well-known pigmentation of the face, the areola mammæ, and other parts, we may have herpes, eczema, or pruritus.

The serious aggravation which pregnancy is liable to induce in many disorders previously existent, is well known, and this exacerbation provides in some cases an indication for the induction of artificial abortion. This necessity may arise in severe cases of renal, cardiac, pulmonary, or hepatic disease, in progressive anæmia, severe osteomalacia hæmophilia, and many other acute and chronic pathological states, since, in exceptional cases, as pregnancy advances, the

symptoms of any one of these diseases may become so threatening, that the patient's life is either in immediate danger or is almost certain to be in danger within a very short space of time — this may occur, for instance, in diabetes, struma (goitre), or certain nervous diseases, such as chorea, polyneuritis (multiple neuritis), or mental disorders. Undoubtedly, in this connection, as *W. A. Freund* insists, it is not the actual nature of the disease that is of decisive importance, but rather its intensity, and its influence on the health of the pregnant women; these circumstances, considered in relation to the resisting powers of the patient, must be determinative in the adoption of measures for terminating the pregnancy. An indication for the induction of artificial abortion is generally furnished also by uncontrollable vomiting dependent on pregnancy and endangering the life of the patient; irreducible incarceration of a retroflexed gravid uterus in the pouch of Douglas, or of a gravid uterus in a hernia, or irreducible prolapse of a gravid uterus will also necessitate abortion.

W. A. Freund gives an example of a common pathological state, usually quite free from danger, but now and again, when associated with pregnancy, seriously endangering life and rendering the induction of artificial abortion absolutely necessary — this is acute *struma vasculosa* — (vascular enlargement of the thyroid body), which may during the first three months of pregnancy exhibit such rapid growth as to lead to severe orthopnœa and cyanosis and so to imperil the patient's life.

In cases in which laryngeal tuberculosis exists as a complication of pulmonary tuberculosis, the former disease sometimes progresses so rapidly in the course of pregnancy that sudden death from œdema of the glottis is by no means rare. *Freund*, therefore, sees in this complication an absolute indication for the artificial termination of the pregnancy.

In cases of previously well-compensated vulvular lesions of the heart, disturbances of compensation not infrequently occur as a result of pregnancy; whilst in cases in which cyanosis, dyspnœa, albuminuria, and dropsy existed even before pregnancy, the latter condition is likely to result in an aggravation of these symptoms to a degree that imperils life.

Parturition, to an even greater extent than pregnancy, may induce serious injuries to the female organism. Thus, during parturition, lacerations of the vagina are frequent, with consequent scar-formation and stenosis; lacerations of the perineum are also common, causing great inconvenience, and when complete, leading to incontinence of fœces with all its unpleasant consequences. Great is the danger arising from septic puerperal inflammations, such as pelvic peritonitis (perimetritis); serious are the results of puerperal vesico-vaginal and recto-vaginal fistulæ.

A large part in the local pathology of the female genital organs is played by the various displacements of the uterus, either arising in consequence of inflammatory processes in their ligaments, or dependent upon relaxation of these ligaments from subinvolution of the internal generative organs, either following delivery at full term or following abortion.

The injury which women alike of the well-to-do and of the laboring classes suffer in consequence of numerous and frequently repeated pregnancies, is minutely described by *Hegar*. "We can," he writes, "calculate the danger to life to which such an unfortunate woman is exposed by the act of reproduction. If we assume the ordinary mortality of women in childbed to be 6 per mille, then, in a woman who within 15 years has been delivered 16 times (whether prematurely or at full term, the danger will be 16 times as great as that of a single delivery, and the mortality will be $6 \times 16 = 96$ per mille; that is to say, of 1,000 women who have all been pregnant that number of times, 96 will die — nearly 1 in 10. Moreover, in this calculation the increased danger consequent upon the unusually rapid sequence of the deliveries has not been taken into consideration. And, again, only the immediate results of the deliveries have been taken into the account. Not infrequently women succumb at a later date to illnesses acquired in childbed; whilst others, in consequence of repeated pregnancies, have their powers of resistance so greatly diminished, that they are unequal to the contest with incidental diseases. In any case, a woman who has experienced numerous and rapidly successive pregnancies, has sustained damages which will endure for the rest of her life. Her tissues have lost their elasticity, the abdominal walls are flaccid, the abdomen is prominent, the abdominal viscera are displaced, the vessels dilated, the reproductive organs in a state of subinvolution, and are the seat of structural alterations. The greatest dangers arise in cases in which the pregnancies are consequences that have to be paid for illicit love, since in such cases syphilitic and gonorrhœal infection are exceptionally common. These complications, indeed, are not excluded in the case of married women, since marital infidelities occur, and, again, a premarital but not completely cured venereal illness may bear fruit in marriage, the latter occurrence being almost always attributable to the husband. Syphilitic or gonorrhœal infection may also arise in some other way than by copulation, and to this women are more exposed than men, owing to the greater size of the genital passage in the former."

Very numerous are the disorders of the nervous system referable to the sexual functional activity of woman during this epoch of her sexual life.

Freund, in his description of a neurasthenic symptom-complex to which he gives the name of *angst-neurosis*,³⁶ maintains that the cause of these attacks of anxiety³⁶ is very frequently to be found in a number of injurious influences in the sphere of the sexual life. In women, these anxiety-neuroses occur:

a) As virginal anxiety, or anxiety of adolescents. *Freund* has observed a number of unequivocal instances showing that a first encounter with the sexual problem, a rather sudden unveiling of what has hitherto been concealed, as, for instance, the sight of some sexual act, or something read or heard in conversation, may, in a girl at the time of puberty, give rise to an anxiety-neurosis, which is in a very typical manner combined with hysteria.

b) As anxiety of the newly married. Young wives who have been without sexual feeling in their first experience of intercourse are not infrequently attacked by an anxiety-neurosis, which, however, disappears as soon as the sexual feeling becomes normal. Since, indeed, the majority of young women who lack sexual feeling in their first experience of sexual intercourse remain nevertheless quite healthy, it is evident that some other cause must coöperate in arousing the anxiety-neurosis.

c) As anxiety in married women whose husbands suffer from *ejaculatio præcox* or from great diminution of sexual potency, or

d) Whose husbands practice *coitus interruptus* or *coitus reservatus*. Cases in these two classes are closely associated, since it is easy to ascertain, from the analysis of a sufficiently large number of cases, that the really important question is, whether during coitus the wife obtains or fails to obtain sexual satisfaction. In the latter event, the condition requisite to arouse the anxiety-neurosis is supplied.

e) As anxiety in widows and in voluntary abstinentes, not infrequently in typical combination with impulsive ideas.

f) As anxiety in the climacteric period, during the final flare-up of sexual passion.

Numerous anomalies of the genital organs which gave rise in the virgin to no trouble whatever display their influence during the menacme by unfavorably affecting the nervous system. Thus, in cases of malformations of the external organs of generation, slight atresia of the vagina, a rudimentary condition of the vagina, a rigid hymen, or local changes in the vagina, it is only when sexual intercourse begins that neuroses or hysteroneurasthenic troubles ensue.

³⁶ The German word *Angst*, here translated *anxiety*, is used in various senses, ranging from *anxiety* to *anguish*, according as the mental element or the element of pure feeling predominates in the conception. In the case of the *angst-neurosis*, however, a condition of *mental* uneasiness would appear to be connoted, and therefore *anxiety* is the best rendering.—Tr.

So also at times nervous diseases which, though the disposition to them was present, were latent in the girl, such as epilepsy and various mental disorders, first become apparent in consequence of sexual intercourse.

The mechanical irritation of the nerves of the pelvis that occurs in sexual intercourse may, even in women whose reproductive organs are healthy, arouse sensations of weight, pressure, and bearing-down, various painful sensations in the sacral region, over the coccyx, in the buttocks, or in the upper part of the thighs, and also "lumbar enlargement symptoms,"³⁷ viz., weakness of the lower extremities, abnormal sensations of fatigue in the lower extremities and the back, sometimes also disorders of micturition and defæcation.

Throughout the manifold diseases of women in or connected with the reproductive system during the age of sexual maturity, associated mental processes take place, which powerfully affect the nervous system. Such processes are, melancholy and anxious thoughts concerning the possible influence of the illness on the happiness of married life, concerning childlessness, or concerning loss of a husband's sexual esteem, or again, fear that the affection will become cancerous, fear of some necessary operative procedure, or vexation in consequence of the limitation of her usefulness as housewife, wife, and mother. Thus in women suffering from sexual affections, a state of general neurasthenia, or some neurasthenic functional disturbance of other organs, very commonly arises.

The knowledge that she is suffering from an affection of the genital organs, makes a deep and lasting impression on the mind of a woman who takes a serious view of her duties as a wife, and whose thoughts and feelings are concentrated in the sexual sphere. The result is, that minor troubles are regarded through the magnifying lens of anxiety, and the general sensibility is increased. This hyperæsthesia is not confined to the affected region, but manifests itself in various other parts of the body by numerous phenomena of a reflex character. In the first place must be mentioned severe headaches, sacache, sensations of pressure in the abdomen, cardiac troubles, palpitation, stomach-ache, nausea and retching and disorders of appetite and digestion. Capacity for work and the enjoyment of life are destroyed by these disorders.

We have further to take into account the numerous conditions liable to disturb the mind at this period of life. In childless women, we have the subject of their sterility, the continued yearning to be blessed with children, the eager search for a remedy, and not rarely in these cases the conflict between the reproductive impulse and the ethical principle of conjugal fidelity. In fruitful mothers, on the

³⁷ German, *Lendenmarksymptome*.

other hand, we have the anxiety lest, by too frequent childbearing their beauty should be impaired and the livelihood of the family endangered; these considerations leading in many cases to the practice of *coitus reservatus*, with its deleterious physical and moral consequences. In the middle and working classes, we have the strain of the endeavor to be a helpful companion to the husband and at the same time to assist in the support and the education of the children. Last but not least, we have the potent influence of local therapeutic measures, and the fear of operative procedures, both of which have a most agitating effect on a woman's mind. In truth, the menacme is a period full of stormy excitations and powerful revolutions.

In addition to its influence on the genital organs themselves, the sexual life of woman during the period of the menacme manifests its powers for evil especially in relation to the digestive functions, and to the functions of the heart and the nervous system.

When we compare the various consequences which may be induced in the principal organic systems as a result of functional disturbances and organic diseases of the female genital organs, we find that in respect of the frequency of their occurrence the diseases of the nervous system occupy the first rank; next in frequency come the disorders of the digestive organs that arise in sympathetic association with diseases of the female reproductive organs; whilst the third rank in respect of frequency and importance is occupied by the cardiac disorders that arise in connection with changes in the female organs of generation, and take the form either of disturbances of the heart's functions or structural changes in the heart's muscle.

Dyspepsia Uterina.

Although it has long been a familiar observation that pregnant women and women suffering from diseases of the reproductive organs suffered from various dyspeptic troubles, I was myself the first (in the *Berliner Klinische Wochenschrift*, 1883) to bring together, and to describe under the name of *dyspepsia uterina*, a peculiar group of dyspeptic conditions which are dependent upon diseases of the female reproductive organs. I dismissed from consideration organic diseases of the stomach and intestine dependent upon anatomical changes in these organs, even though these also might owe a similar etiology, and described only the more frequent dyspepsias occurring without organic change in the digestive apparatus, the origin of which is to be explained by the fact that certain structural changes and displacements of the uterus (to be discussed later) arouse centripetal impulses, and that these exercise a reflex influence on digestive activity.

This influence, according to my observations, affects the secretory and muscular apparatus and also the nervous elements of the digestive tract, and I regard the following conditions as characteristic of uterine dyspepsia, though they do not necessarily all occur simultaneously: changes in the gastric secretion, excitement of the vomiting centre, an inhibitory influence on intestinal peristalsis, and hyperæsthesia of the stomach.

The symptoms of uterine dyspepsia may vary greatly in intensity, but not infrequently become so severe as to disturb very seriously the general health of the woman so affected. They may be enumerated as follows: The appetite in uterine dyspepsia is variable, but is generally good; the tongue is not usually coated to any great extent, nor does the mucous membrane of the mouth commonly exhibit any notable change; pain in the epigastrium is common after meals, with acid eructations and heartburn (*pyrosis*),³⁸ sometimes there is violent vomiting, occurring after every meal, or in the morning on an empty stomach; in addition, constipation is an almost constant symptom, associated with excessive development of gases in the intestinal canal. The pain is usually dull in character, and somewhat relieved by pressure, but it may be severe and lancinating, and may shoot along the intercostal spaces. The accumulation of flatus within the abdomen gives rise to various painful sensations, distension, a sense of fulness; and its expulsion is attended with notable relief.

As regards the composition of the gastric secretion, an increase of acidity is sometimes noticed. Gastric digestion is retarded; experimental evacuation of the stomach, after a simple test meal (beef-steak and roll) showed that small quantities of undigested remnants were to be found in the stomach as long as seven or eight hours afterwards. The frequent eructations evacuate flatus, or else a watery fluid with an acid reaction (*pyrosis* or *water-brash* — see note 38). By the act of vomiting, larger or smaller masses of the food that has been taken are evacuated; in the vomit, *sarcinæ* in large numbers may frequently be detected by the microscope. Constipation is present in nearly all cases of uterine dyspepsia; and even in cases in which attacks of diarrhœa occur from time to time, careful examination will show that these are generally transient, being sequelæ of constipation due to the irritation caused by the accumulated masses. In one case of long-standing uterine dyspepsia, I observed, in the absence of any gastric dilatation, the well-known

³⁸ German, *saures Aufstossen und Sodbrennen*; for the latter noun *heartburn* would appear to be the most precise English equivalent, since the term *pyrosis* is sometimes employed to denote the *acid eructation* (or *water-brash*) and sometimes the accompanying sensation at the pit of the stomach — *heartburn* or *cardialgia*. Etymologically, of course, the latter sense of *pyrosis* is correct (Greek, *πῦρ*, fire).—T.L.

phenomenon of "peristaltic restlessness of the stomach" (*tormina ventriculi nervosa*), in which the peristaltic activity of the stomach is greatly exalted, and becomes visible to the naked eye in the form of large and powerful undulations in the gastric region, moving from left to right.

With these symptoms affecting the digestive organs are associated variable nervous manifestations in different organs, such as neuralgia of various nerves, palpitation of the heart, vertigo, headache, and nervous asthma. The general nutrition of the body often suffers considerably in cases of long-enduring uterine dyspepsia; excessive emaciation and general marasmus may ensue; we see also mental depression, melancholia, an irritable disposition, and disinclination for every kind of work.

Very important, but very difficult, is the differential diagnosis between uterine dyspepsia, on the one hand, and, on the other, chronic gastric catarrh, chronic ulcer of the stomach, nervous dyspepsia, and sometimes even carcinoma of the stomach.

As regards the distinction from chronic gastric catarrh, in this latter disease loss of appetite and changes in the oral mucous membrane are prominent symptoms; the vomit also usually contains much mucus. More difficult is the differential diagnosis of chronic ulcer of the stomach, in cases in which anæmic subjects complain of anomalies of menstruation, associated with dyspeptic troubles and cardialgia. In severe cases of uterine dyspepsia, the distinction from carcinoma of the stomach may be very difficult—at any rate in cases in which no examination of the genital organs has been made. Obstinate dyspeptic troubles, resisting all curative measures (unless indeed these are directed to the relief of the local disorder of the reproductive organs), progressive anæmia, great emaciation, and pains localized in the stomach, are all conditions common to both of these maladies. The absence of a tumor of the stomach, careful examination of the vomit, and examination of the genital organs, will lead to a correct diagnosis if the case is one of uterine dyspepsia. A superficial investigation is exceedingly likely to result in a case of uterine dyspepsia being regarded as one of nervous dyspepsia (*von Leube*); none the less, even though a very close resemblance exists between the symptoms of the two diseases, to differentiate them is a matter of importance. In nervous dyspepsia, the act of digestion influences the nervous system in such a manner that, even when the chemical processes are normal, the organism as a whole is sympathetically affected by a reflex from the stimulation of the nerves of the stomach, and in return reacts on the mechanical process of digestion in a more or less violent manner. In uterine dyspepsia, however, the relationship that obtains is exactly the reverse of this,

inasmuch as the gastric activity is influenced by the nervous system, by reflex impulses originating in the morbid processes in the reproductive organs; moreover, in this form of dyspepsia, in direct contrast with nervous dyspepsia, the chemistry of digestion is often disordered, and, in addition, the process is not completed within the normal period.

Oftentimes, the diagnosis of uterine dyspepsia can be made with certainty only *ex juvantibus*.⁸⁹ For this disorder cannot be cured unless the disease of the reproductive organs on which it depends is first relieved; and, conversely, local measures for the relief of uterine disease, will often at once remove all the dyspeptic troubles from which the patient suffers.

My own experience has led me to conclude that it is certain distinct local mechanical stimuli affecting the female genital organs which, acting for a long period on the sensory nerves of the uterus or its annexa, induce by reflex action the before-mentioned digestive disturbances. Diseases of the vulva and the vagina, catarrhal inflammation, colpitis and leucorrhœa, and prolapse of the vagina, do not by themselves lead to the occurrence of uterine dyspepsia; nor do inflammations of the uterine mucous membrane, such as endometritis (unless associated with parenchymatous changes of the whole uterus), chronic catarrh of the mucous membrane, erosion and ulceration of the cervix to an inconsiderable extent, or moderate perimetritic and parametritic exudations. On the other hand, uterine dyspepsia frequently ensues in cases of uterine displacements, flexions, or versions, or in cases of structural changes of the uterus accompanied by enlargement of the organ, chronic metritis, myomata, especially when intramural (interstitial), displacement of the Fallopian tubes and the ovaries, chronic oöphoritis, extensive inflammatory exudations, resulting from pelvic peritonitis, and leading to dislocation, "compression" or distortion of the uterus and its annexa, deep follicular or carcinomatous ulceration of the cervix, or, finally, ovarian tumors. As the commonest condition giving rise to dyspeptic disturbances of the kind under consideration, retroflexion of an enlarged uterus must be mentioned.

Under the head of uterine dyspepsia, we may also classify dyspeptic disturbances occurring at the time of puberty or of the menopause, and in association with certain amenorrhœic and dysmenorrhœic conditions, and, in addition, the vomiting of pregnant women.

The vomiting of pregnant women, which must be regarded as a reflex disturbance of the stomach, occurs, with especial severity in first pregnancies, in the early months of pregnancy, with such regularity that it is regarded as one of the most typical signs of preg-

⁸⁹ By consideration of the results of treatment.

nancy. Thus, in 177 pregnant women, *Horwitz* observed vomiting in 147 (83 of whom were primiparæ, and 64 multiparæ), and in 29 only was this symptom wanting. In this series of cases, it most commonly made its appearance between the tenth and eleventh week of the pregnancy. The vomiting of pregnant women occurs most commonly early in the morning, immediately after rising (morning sickness), but also at other times of the day; it usually takes place easily, without any great distress, and after it is over the patient feels quite comfortable. It rarely continues later than the fourth month of pregnancy.

Very serious in its effect on the general state of nutrition is the uncontrollable vomiting that sometimes occurs in pregnant women (*hyperemesis gravidarum*), lasting throughout the whole term of pregnancy. It must be regarded as an exaggeration of the physiological vomiting of pregnant women, in patients whose nervous equilibrium is profoundly disturbed; but equally with the ordinary "morning sickness" is it dependent on the reflex stimulation of the nerves of the stomach exercised by the growing uterus. One source of such stimulation may be found in the stretching of the peritoneal investment of the uterus which results from the enlargement of that organ; another, in certain displacements of the uterus; but in addition to these local anomalies, we must assume the existence of a peculiar predisposition on the part of the nervous system, in virtue of which reflex irritability is increased, while the power of reflex inhibition is diminished.

The prognosis and treatment of uterine dyspepsia depend chiefly upon the nature of the diseases of the female genital organs that have given rise to the disturbances of digestion, and this pathological relationship demands above all a careful investigation. The following instance from my own case-book may be regarded as typical of cases of this class. Mrs. N., aged 25, married 6 years, barren, complains of severe dyspeptic trouble. Appetite fairly good, but after every meal severe gastralgia occurred, with heartburn and acid eructations, and very often the food was rejected; there was also obstinate constipation, and great distress from the accumulation of flatus in the intestinal canal. No blood was ever seen in the vomit. The patient was much emaciated, and was greatly depressed in spirits. Neither in the lungs nor in the digestive organs had any of the physicians under whose care the lady had been for the last four years found any abnormal change to account for the stormy manifestations. Now, at length, the gynecological examination, which had hitherto been neglected, was undertaken. The uterus was found to be strongly retroflexed and enlarged. Rectification of the position of this organ was immediately followed by the disappearance of all the stomach troubles; the vomiting ceased, some months

later the woman became pregnant, and pregnancy and parturition were quite normal; since then there has been no return of the dyspepsia.

Since the appearance of my work on dyspepsia uterina, numerous observations have in recent years been published, proving even more clearly the causal dependence of disturbances of the gastric function upon diseases of the female genital apparatus.

Lamy, for example, has made an elaborate study of one of the above-mentioned symptoms of uterine dyspepsia, namely, excitement of the vomiting centre. His conclusions are as follows: Among the general symptoms of diseases of the uterus, dyspepsia, in all its forms and in all degrees of intensity, occupies the first rank in respect of frequency of occurrence. Among the accompaniments of these reflex processes, uterine vomiting must be mentioned. It seldom occurs as the sole symptom of disorder of the digestive organs; but when it does occur alone, it is of great importance that the cause of the affection should not be misunderstood. Diseases of the uterus and periuterine affections are the conditions that most commonly give rise to this trouble, but in a certain number of cases it is due to physiological changes in the female genital organs. Such changes are those associated with the functional activity of the reproductive apparatus at the time of puberty, during menstruation, in connection with coitus, during pregnancy, and at the change of life, the menopause. The vomiting of pregnant women is of the same nature, and confirms our belief in the uterine origin and pathogenesis of vomiting at other times than during pregnancy. The diagnosis of the true cause of uterine vomiting cannot be made from the nature of the latter, but only from a knowledge of the conditions in which it occurs, just as with other uterine reflexes, such as neuralgia or cough. The vomit may consist merely of the food last taken, or it may contain bile, without the presence of this latter constituent indicating the existence of any disease of the liver. The treatment of this disorder, which indeed does not threaten life, but does seriously impair the general state of nutrition, must be local, directed against the disease of the genital organs: Thus, in one case of this nature, a cure was effected by oöphorectomy.

The majority of the women in whom *Lamy* observed this symptom of uterine dyspepsia were chloro-anæmic individuals with an irritable nervous system, town-dwellers, young girls in whom frequent evening parties and dances, ill-chosen diet, and a generally unsuitable mode of life, had led to the development of a "virginal metritis." The signs of the disturbance of the gastric functions were in the first place a retardation of gastric digestion while the appetite remained good. Moreover, the stomach was

often distended with flatus, and this caused frequent gaseous eructations; there was also epigastric pain, which made it difficult for the patient to bear the pressure of the clothing, and sometimes great pain was aroused by the slightest contact. The attacks of vomiting, which occurred in a characteristic manner with periodical intervals of freedom, were usually preceded for a longer or shorter period by dyspeptic symptoms. The vomiting itself, if it occurred immediately after a meal, was not accompanied by nausea, a feeling of faintness, or cold sweats, but rather resembled a kind of painless regurgitation; but when the vomiting did not occur till some hours after food had been taken, it was painful, and the vomit was then green-tinted owing to the admixture of bile.

The gastric troubles that occur during menstruation are regarded by *P. Müller* as a further indication of the intimate connection between the genital organs and the digestive tract. In women who suffer from hysterical manifestations, gastric disturbances, cardialgia, and nervous dyspepsia, are very frequently associated with menstruation. These gastric symptoms generally make their appearance a few days before menstruation is due, and disappear as soon as the flow is established. In other forms, again, the digestive troubles set in with the appearance of the flow, to disappear during the later course of menstruation; and in yet other cases the gastric disturbance begins even later, and ceases only when the flow comes to an end. These symptoms may occur in women in whom the genital organs are perfectly healthy and in whom menstruation runs a regular course. More severe symptoms may, however, appear if menstruation is disturbed for any reason, or if it is suppressed. Not rarely such women, when they become pregnant, suffer, especially during the early months, from dyspeptic symptoms; but similar dyspepsia may occur in pregnant women who have previously been quite healthy.

To the same category belong the cases formerly described by *von Leyden* under the designation of neuralgia and hyperæsthesia of the stomach, which he observed in young girls as a sequel of menstrual disturbances, and more particularly of *suppressio mensium*. In these circumstances, the sensibility of the stomach may become so extreme that every time food is taken the patient suffers from such severe pains, or from so distressing a sense of anxiety and oppression, that she comes to eat less and less, and an extreme degree of emaciation and marasmus results. In one such case, congenital atrophy of the uterus was discovered on gynecological examination.

According to *R. Arndt*, it is especially in chloro-neurotic individuals that the stimuli proceeding from morbid conditions of the reproductive organs frequently induce, by reflex action, all kinds

of disturbances of the alimentary tract, such as constipation and flatulence, gastric uneasiness and loss of appetite, weakness of digestion, cardialgia, and stricture of the œsophagus. Even simple menstruation suffices to give numerous proofs of this fact, but still more do such consequences arise from serious diseases of the reproductive organs, such as changes in form, displacements, and inflammatory states, and also, on the other hand, more or less pronounced hypoplasia.

G. Braun has published three cases illustrating the connection between neurosis of the stomach and uterine disorders. In the first of these cases, severe digestive disturbances occurred after every meal, with occasionally violent vomiting, in a woman, aged twenty-five years. No changes were found in the stomach or other digestive organs, and the symptoms obstinately resisted all direct treatment. Gynecological examination showed extreme mobility of the uterus, and for the relief of this a suitable pessary was introduced. The vomiting thereupon immediately ceased, all the other digestive troubles passed completely away, and the general state of nutrition, which had before been so much impaired as to necessitate the use of nutrient enemata of meat-solution, now became normal. The second case was that of a woman aged thirty, who, since her last confinement two years before, had continually suffered from disagreeable gastric sensations and from vomiting, which latter had proved quite uncontrollable. Gynecological examination disclosed extensive laceration of the cervix with ectropium of the mucous membrane. An operation was performed for the relief of this condition, and the vomiting of two years standing was also thereby cured. In the third case, that of a woman twenty-eight years old, vomiting began three months after her confinement, and recurred whenever the patient left the recumbent posture, in which latter she felt quite well. On local examination, the uterus was found to be prolapsed, the vaginal portion of the cervix moderately enlarged and just within the vaginal orifice. Amputation of the vaginal portion of the cervix cured the vomiting and completely restored the patient's health.

The frequency of gastric affections in cases of retroflexion of the uterus is insisted on by *Panewski*. In eight instances he found neuroses of the stomach consequent upon such retroflexion, and in all cases a cure immediately followed rectification of the position of the uterus. He urges that if after the reposition of the retroflexed uterus the gastric troubles should still persist, a careful local examination of the stomach is indispensable.

Eisenhart, in a woman forty-two years of age, corrected a mobile retroflexion of the uterus, and thereupon very severe gastric symptoms of several months' duration soon disappeared. *Graily-Hewitt*,

in an unmarried woman twenty-seven years of age, cured by reposition of a retroflexed uterus a gastric disorder which had subsisted for nine years; *Elder* and *Henrik* report identical results in gastric troubles consequent on retroflexion or retroversion of the uterus. *Jaffé*, in a virgin, aged twenty-three, who had been brought near to death by gastric disorder with vomiting, found on local examination that there was a profuse, thick, purulent discharge from the interior of the uterus; curetting, and irrigation of the uterine cavity with antiseptic solutions, gave immediate relief to the stomach trouble. Similar experiences are recorded by *C. van Tussenbeck* and *Mendes de Leon* in cases of gastric disorder consequent on *endometritis fungosa* and *endometritis interstitialis parenchymatosa*; and by *Gottschalk*, in cases consequent on sarcoma of the chorionic villi. *Lewy* and *Butler-Smythe* have observed the relief of pernicious vomiting by *Emmet's* operation (trachelorrhaphy).

As regards the relations of gastro-intestinal affections to the diseases of the reproductive organs, *Theilhaber*, in the cases observed by himself, distinguishes three groups. In the first group of cases, the gynecological abnormality was a chance accessory, and was not the cause of the gastric trouble. In the second group, he regards the gynecological trouble as dependent upon the affection of the gastro-intestinal tract, believing that, in consequence of atony of the intestine and an accumulation therein of fæces and flatus, a retardation of the circulation occurs in the region of the inferior vena cava, resulting in venous stasis in the uterus, and so giving rise to metrorrhagia, dysmenorrhœa, and fluor albus. In the third group of cases, *Theilhaber* believes that the uterine trouble is the cause of the disturbances in the stomach and intestine. He, like myself, has found in all these patients an inhibition of the intestinal movements; but he found, on the other hand, that the gastric secretions were more commonly normal, and that only in a small proportion of the cases was the vomiting centre excited. Further, in the majority of these women, the course of the digestive processes was quite normal; and, finally, in his series of cases, endometritis was one of the commonest causes of consecutive gastric disorders. His observations led him to conclude that "in consequence of affections of the uterus a large number of different symptom-complexes of gastric trouble occur:" the pure nervous dyspepsia of *Leube*, dependent on atony of the large intestine and atony of the stomach, hyperchlorhydria and anacidity, periodic gastralgia without anatomical cause, etc.

Cardiopathia Uterina.

I use the term *cardiopathia uterina* to denote the manifold cardiac disorders which occur in women as reflex processes excited by the

physiological functions and the pathological disorders of the genital organs, and take the form of very various disturbances of the cardiac function. Every phase of the sexual life of women — that in which the reproductive organs attain complete development and menstruation first appears (the menarche); the commencement of sexual intercourse; pregnancy, parturition, and the puerperium; finally the retrogressive process at the climacteric age, of which the menopause is the outward manifestation — may give rise to the occurrence of such cardiac troubles. In order to explain these troubles as reflex in their nature, we must on the one hand recur to the anatomical changes in the uterus and its annexa that take place in every one of the above-mentioned phases of the sexual life; and on the other hand we must take into consideration the mental processes that accompany these anatomical changes, in order to estimate their influence upon the motor and sensory nerves of the heart (see the sections on the *Menarche* and the *Menopause*).

A certain predisposition to uterine cardiopathy exists in many individuals and in many families. This predisposition may be manifested in this way, that in women who at the time of the menarche have suffered from cardiac disorder, similar cardiac disorder is likely to recur at the time of the menopause, the symptoms of the recurrent attack being in most cases identical with those that occurred during the menarche. In the well-to-do and cultured circles of society, uterine cardiopathy is far more frequently encountered than among the working classes. Both unusually early and unusually late commencement of menstruation tend to favor the occurrence of uterine cardiopathy. The most valuable therapeutic measures that we can employ to combat these disorders are suitable dietetic and hygienic regulations, in association with favorable mental influences.

Diseases of the female reproductive organs, including simple functional disturbances, are very frequently accompanied — far more frequently than has hitherto been supposed — by cardiac disorders. But whereas in some cases these cardiac disorders are directly dependent upon the disease of the genital organs; in other cases no such etiological relationship can be shown to exist, and the association must, therefore, be regarded as fortuitous.

In cases of the former kind, the dependence of the cardiac disorder upon the disease of the genital organs is very variable in its nature.

Reflex manifestations on the part of the nervous system may be aroused by pathological changes in the genital organs, in a manner similar to that discussed in other parts of this work in regard to the cardiac troubles that are liable to occur during the menarche and the menopause; such cardiac disorders are indeed excited especially by changes in the ovaries, by disturbances of menstrual ac-

tivity, by suppression of the menses—as manifestations, that is to say, of the menstrual reflex. The cardiac disorder most commonly takes the form of tachycardiac paroxysms, recurring periodically, either in association with the menstrual flow, or, if this is in abeyance, at the times at which it ought to appear. We must assume in these cases that the local stimuli aroused by the pathological changes in the uterus and the ovaries have a reflex influence upon the cardiac nerves, by means of which the heart's action is increased in frequency, without inquiring more particularly whether the reflex influence is effective by inhibiting the normal action of the vagus, or by stimulating the sympathetic, or, perhaps, by a combination of these factors. Much more rarely do we notice, in association with disorders of the reproductive system, a reflex decrease in the frequency of the heart's action, this effect being explicable in the same manner as the well-known experiment of *Golz*, in which, if the abdomen of a frog be laid bare, and the intestine be struck sharply with the handle of a scalpel, the heart will stand still in diastole with all the phenomena of vagus inhibition.

In another group of diseases of the genital organs, the disturbances of cardiac activity may be brought about by pressure which, in consequence of the morbid processes in the reproductive organs, is exercised upon individual nerves or upon an entire nerve plexus. Tumefied and prolapsed ovaries, an enlarged and misplaced uterus, inflammatory nodules and hyperplasias of the intrapelvic connective tissue, contractile processes in the parametric connective tissue,⁴⁰ tumors of the uterus whether intramural or in the interior of that organ, ovarian tumors, prolapse of the uterus, and intrapelvic peritoneal adhesions resulting from inflammatory processes—these are the principal conditions liable to occasion reflex cardiac disorder; but certain tissue changes, such as endometritis, erosions (chronic cervical catarrh), and ulcerations of the genital passages, with or without exposure of nerve-endings, are also competent to produce the same effect. Here the sympathetic nervous system constitutes the channel by means of which the stimuli affecting the nerves of the genital organs are conveyed to the central nervous system, and by means of which also the reflex manifestations of this stimulation are produced, taking the form, partly of disorder of the cardiac action, of palpitation of the heart and paroxysmal tachycardia, and partly of pains in the cardiac region and disturbances along the course of the great vessels.

Further, in cases of long-continued disease of the female genital

⁴⁰ *Ger. in den Parametrien.* The reasons for preferring the phrase *parametric connective tissue* to the noun *parametrium* will be found in the English edition of Toldt's *Atlas of Human Anatomy*, Part IV, App. note 84.

THE SEXUAL LIFE OF WOMAN.

organs associated with severe hæmorrhage and in some cases fluor albus, nutrition in general and hæmotopoiesis may be seriously affected, and disturbances of cardiac activity may result, as, for instance, is frequently witnessed in chloro-anæmic states. In such cases we have palpitation of the heart, both subjective and objective, a weak and compressible pulse, often irregularity of the heart's action, singularly clear heart sounds, often, however, systolic murmurs at various orifices, increased frequency of heart and respiration to a disproportionate degree on slight exertion, strong pulsation of the carotids, and slight œdema of the ankles.

Often, however, the disturbance of cardiac activity is dependent also upon degenerative processes in the myocardium, upon fatty degeneration and the consequent dilatation of the cavities, this degeneration being a consequence of the growth of a uterine tumor and especially of uterine myomata, or resulting from some constitutional disorder which is itself dependent upon the affection of the genital organs. In such cases the signs of degeneration of the heart are very striking: weakening of the cardiac impulse, notable faintness of the sounds of the heart, occasionally reduplication of the second sound, a galloping rhythm, while percussion shows the existence of considerable dilatation of the left, and still more frequently of the right ventricle; in many cases also we have angina pectoris, passive hyperæmia of the lungs, the mucous membranes, and the extremities; and sudden death sometimes ensues.

No less important are the mental influences exercised by diseases of the genital organs in which operation is proposed or actually performed, also by long-lasting diseases of the reproductive organs and by the disturbances these diseases produce in the reproductive functions, more especially in relation to copulation and the actual process of reproduction. In this way cardiac neuroses of various kinds may be induced.

Finally, cases have come under my notice in which the cardiac trouble was not the direct result of the disease of the genital organs, but was a consequence of the therapeutic measures employed for the relief of the latter; and in this connection I must regard as especially blameworthy, in addition to intrauterine manipulations, such as sounding and cauterization, the modern practice of gynecological massage.

Not all diseases, however, of the female reproductive apparatus, tend in a similar manner and with equal frequency to give rise to consecutive cardiac disorders. According to my own observations, the diseases of the vulva and the vagina, catarrhal inflammation, colpitis (vaginitis), leucorrhœa, and prolapse of the vagina (cystocele and rectocele), are those which most rarely induce cardi-

opathy; unless, indeed, the diseases just enumerated have led to the occurrence of vaginismus, for in this latter condition cardiac trouble not uncommonly ensues. More commonly than by vulval and vaginal diseases, cardiac troubles are induced by inflammation of the uterine mucous membrane, as by chronic endometritis, by erosion and "ulceration" of the cervix (chronic cervical catarrh); they also sometimes occur in connection with perimetritic and parametritic exudations. Most frequently of all, and most severely, cardiac disorders are aroused by displacements of the uterus, flexions or versions; by structural changes of the uterus accompanied by enlargement of that organ, such as chronic metritis and the growth of myomata (especially intramural); by prolapse, enlargement, and tumor of the ovary; by intrapelvic exudations which when extensive give rise to displacement or compression of the uterus or its annexa. In cases of carcinomatous or other malignant new growths affecting the reproductive organs, I have in comparison very rarely observed the occurrence of reflex cardiac disorders.

Disturbances of menstrual activity, amenorrhœa, menorrhagia, and dysmenorrhœa, owning the most varied causes, very frequently give rise to cardiac trouble, a point on which we have already insisted. (See page 142, *et seq.*)

Very violent forms of cardiac neurosis have been observed by me in women suffering from chronic disorder of the reproductive organs, who have consulted one gynecologist after another and have been subjected to many different methods of local treatment; also in women who have for a long time suffered from some gynecological ailment hitherto believed to be trifling, but who have at length suddenly been informed that some severe operative procedure has become necessary. In such cases the cardiac trouble took a paroxysmal form, the intervals being usually considerable, several weeks or months in duration, and the general system was as a rule seriously involved in the attacks. These latter began with severe cardialgia, radiating from the cardiac region outward along the intercostal spaces, upward to the shoulder and along the left arm, sometimes indeed extending into both arms. At the same time the heart's action was greatly increased in frequency, there being sometimes more than 200 beats per minute, the pulse was soft, small, difficult to count, the respiration greatly increased in frequency, sometimes very shallow, with respiratory anxiety, and exceptionally severe general excitement and sense of impending death. In some cases also I observed spasm of various groups of muscles, dizziness (with a sense that the objects of vision were flickering), aphasia, and mental stupor. The paroxysms lasted for some time, two or three hours, as a rule, and gradually passed away. Their character was

that of the cardiac disorder variously described under the names of pseudo-angina and angina pectoris hysterica.

Such attacks as these are followed by a sense of severe general depression and want of energy, and by a decline in body weight. They are distinguished from true angina pectoris by the absence of any signs of arteriosclerosis or of degeneration of the myocardium. They may be regarded as cardiac disorder of duplex causation, being partly dependent on the disease of the genital organs, which gives rise to a number of local afferent stimuli, and partly dependent on mental influences which have a depressant, paralyzing influence on the cardiac nerves; it is possible also that spasmodic contraction of the walls of the coronary arteries or of the myocardium itself is induced as a reflex effect of the local disorder of the reproductive organs.

With regard to uterine myoma as the exciting cause of cardiac degeneration, very numerous observations and experiments have recently been made, and the reality of the occurrence is no longer open to dispute, even if its significance is subject to various interpretations, whilst no satisfactory explanation has yet been forthcoming.

L. Landau writes concerning the disturbances induced in the circulatory apparatus by the growth of myomata in the uterus: "The formation of varices, the occurrence of thrombosis, and, finally, the onset of degeneration of the myocardium, are very common. Should the last-named process result—and it is truly alarming to observe the frequency with which cardiac affections are associated with uterine myomata,—then, by a vicious circle, the uterine hæmorrhages become continually more profuse, in consequence of increasing passive hyperæmia dependent upon diminishing power of the cardiac pump. Venous congestion in the province of the inferior vena cava results in ascites, and sometimes in general œdema; and even in cases in which no increase of the uterine hæmorrhages is observed, the patient may succumb in consequence of secondary disease of the heart. * * * In the great majority of cases, the myoma and the uterine hæmorrhages that result from its growth are the primary cause of the morbus cordis. Naturally in cases which come under observation only when both uterine and cardiac disease are already present, it is difficult to determine with certainty the true causal connection. When, however, a number of patients suffering from uterine myomata are observed, in whom at first the heart was found to be healthy, and subsequently to have become affected; and when, on the other hand, we see patients affected with myoma uteri in whom operation is undertaken notwithstanding the existence of cardiac disease, and in whom, after the

operation has been successfully performed, the cardiac murmurs disappear as well also as the other signs of heart disease, when dilatation can no longer be detected, when the pulse-frequency declines to normal, whilst a previously feeble and compressible pulse gains in tension and power—then it is impossible to doubt that the heart disease was secondary, and was etiologically dependent upon the primary myoma and the uterine hæmorrhages.”

Lehmann and *P. Strassmann* examined the material of the Charité-Policlinik at Berlin in order to throw light on the relation between uterine myomata and diseases of the heart, a connection already proved to exist alike by recent pathologico-anatomical researches, by clinical experience of the results of operations (death from shock), and, finally, by the subjective troubles of the patients (palpitation, venous congestion, giddiness, and syncope). Examining 71 women suffering from myoma uteri, *Lehmann* and *Strassmann* found in 29 (41%) that some abnormality existed in the cardiovascular system, such abnormalities being extremely variable in character, as for instance: hypertrophy or dilatation of the heart, irregularity of the cardiac action, passive hyperæmias, œdema, albuminuria, angina pectoris, and cardiac asthma. The next point was to determine the mutual relations between the heart disease and the development of the uterine myoma. Hitherto it has been assumed that the latter is the primary disease, and such a sequence is certainly the commoner, more especially in cases in which hæmorrhage has been profuse, with consecutive anæmia and fatty degeneration of the heart. In these cases, a certain time after the commencement of the severe hæmorrhages, cardiac troubles make their appearance; such troubles are beyond question secondary, and they disappear as soon as the hæmorrhage has been controlled. In other patients, however, we obtain a history of the appearance of cardiac disorder at a date prior to that when any symptoms occurred indicating the growth of a myoma; in these cases, therefore, the heart disease has developed independently of the uterine disease, and has run a parallel course to the latter; perhaps, indeed, by leading to venous congestion or to rapid changes in blood-pressure, the heart disease may have favored the growth of the commencing or fully developed tumor. In some of the patients, operative measures were followed by rapid recovery from the cardiac disorder (cases of simple anæmia); in a second group of cases, however, the heart disease was uninfluenced by operation (cases of irreparable anæmia, and cases of heart disease independent of the myomata); and, finally, a considerable number of patients remained, constituting a third group, in whom, notwithstanding the removal of the tumor by operation, the heart disease continued to grow worse (cases of progressive heart disease independent of the myomata, especially cases of arteriosclerosis).

Among 120 women of ages between 17 and 48, in whom I found very various functional disorders of or pathological changes in the genital organs, and in whom I made a particular investigation concerning the presence or absence of heart disease and examined the heart carefully, I was able to detect the presence of cardiac troubles in 38 instances. Thus, heart trouble was found to exist in 32.7 per cent. of women suffering from disease of the reproductive organs.

In these 38 persons suffering from cardiac disorder, I found:

Nervous Tachycardia in 21 instances, that is, in about	55.2 per cent. of the cases.
Hypertrophy of the Heart in 4 instances, that is, in about	10.4 per cent. of the cases.
Pseudo-Angina Pectoris in 3 instances, that is, in about	7.8 per cent. of the cases.
Asthenia Cordis in 7 instances, that is, in about	18.4 per cent. of the cases.
Mitral Incompetence in 1 instance, that is, in about	2.6 per cent. of the cases.
Fatty Heart in 2 instances, that is, in about	5.2 per cent. of the cases.

As regards the varieties of functional and organic disease of the genitals met with in the 120 cases, and the number of instances complicated with heart trouble in each variety, I found:

Chronic Metritis in 32 patients, complicated with cardiac disorder in	13 instances.
Chronic Oöphoritis in 10 patients, complicated with cardiac disorder in	4 instances.
Parametric Exudations in 14 patients, complicated with cardiac disorder in	6 instances.
Chronic Endometritis in 16 patients, complicated with cardiac disorder in	2 instances.
Flexions and Versions of the Uterus in 26 patients, complicated with cardiac disorder in	9 instances.
Stenosis of the Cervix in 6 patients, complicated with cardiac disorder in	0 instances.
Tumors of the Uterus and its Annexa in 8 patients, complicated with cardiac disorder in	4 instances.
Infantile Uterus in 3 patients, complicated with cardiac disorder in	0 instances.
Colpitis (Vaginitis) in 5 patients, complicated with cardiac disorder in	0 instances.

From these figures we obtain the following percentages, showing the frequency with which heart trouble occurred as a complication of the respective diseases of the genital organs:

In Chronic Metritis, cardiac disorder was found in	40.6 per cent. of the cases.
In Chronic Oöphoritis, cardiac disorder was found in	40 per cent. of the cases.
In Parametric Exudations, cardiac disorder was found in	42.8 per cent. of the cases.
In Chronic Endometritis, cardiac disorder was found in	12.5 per cent. of the cases.
In Versions and Flexions of the Uterus, cardiac disorder was found in	34.6 per cent. of the cases.
In Tumors of the Uterus and its Annexa, cardiac disorder was found in	50 per cent. of the cases.

To summarize the result of my observations regarding the cardiac disorders secondary to diseases of the female genital organs:

1. Tachycardial paroxysms in cases of amenorrhœa were premenstrual in rhythm, the paroxysms occurred, that is to say, some days before the due date of the suppressed flow.

2. In cases of dysmenorrhœa, I observed heart trouble with severe dyspnœa and feelings of anxiety, also in some cases symptoms of cardiac asthenia; these symptoms were perhaps dependent upon acute dilatation of the heart. The heart trouble associated with profuse menorrhagia exhibited similar characters.

3. Attacks of pseudo-angina pectoris occurred in women in whom local treatment for disease of the genital organs had been carried out for a long time, and in cases in which operative measures were in contemplation.

4. Paroxysms of tachycardia and cardiac distress were observed in connexion with displacements of the uterus, and especially in cases of retroflexion; also in association with oöphoritis and with parametric exudations.

5. Cases of degeneration of the myocardium, sometimes running a rapidly fatal course, were found to be consecutive to tumors of the uterus and its annexa, especially to myomata of the uterus.

Nervous Diseases Secondary to Diseases of the Genital Organs.

In earlier chapters of this work we have frequently referred to the reflex influence exercised upon the nervous system in general, alike by the normal functions and the pathological states of the female genital organs. We must now briefly explain the more intimate connection between nervous diseases and diseases of the genital organs, the causal dependence of local nervous disturbances and of general neuroses upon diseases of the reproductive organs.

The origination of a local nervous disease by a primary disease of the genital organs is dependent upon a simple mechanical process, which is explained by *Windscheid* in the following terms: "In this connection, the two principal mechanical factors are pressure and traction. Pressure may affect individual nerves or an entire nerve plexus, and may be exercised by a tumour, an exudation or a misplaced organ (*Hegar*); further causes of pressure are furnished by inflammatory nodules, by connective tissue hyperplasias, and, according to *Freund*, by contractile processes in the organs themselves and in the ligaments. Traction on the nerves results from displacements, as from prolapse of the uterus or the ovaries, and, according to *Hegar*, from traction on the pedicle of small tumours. A combination of pressure and traction occurs especially in affections

of the abdominal attachments of the uterus, also where there is scarring of the neck of the uterus and of the vaginal fornices. Great importance, also, in relation to the production of local nervous disorders, must be attributed to the laying bare of nerve-terminals by catarrhal and other inflammatory processes. Abnormal mobility of the genital organs as a partial manifestation of enteroptosis must also be mentioned as a cause of mechanical stimulation of the nerves. Finally, in this connection, must be considered the paresis of the abdominal walls that follows frequent and severe confinements."

The symptoms of the local nervous disorders to which these mechanical stimuli may give rise, are very various, but may, according to *Hegar*, be comprised under the general designation of *lumbar enlargement symptoms* (*Lendenmarksymptome*), inasmuch as the local stimulation of the intrapelvic nerves, affects the nerve-centres of the lumbar enlargement of the spinal cord. Among the symptoms, severe pains are prominent, either continuous or intermittent, within the pelvis and in the sacral region, accompanied by a sense of weight and pressure in the abdomen, or by dragging pain in the region of the hips, in the gluteal region, in the outer and back parts of the thighs, in the inner surface of the leg, in the calf, in the dorsum of the foot, the sole of the foot, and the heel; or by coccydynia (pain over the coccyx and the lower extremity of the sacrum), or hyperæsthesia and anæsthesia of the external genitals in the region of the vaginal orifice, or, finally, by disorder of the processes of micturition and defæcation. In some of these cases, the weakness of the lower extremities is so severe that a paralytic condition is simulated. Actual paralysis may however occur, in consequence of the extension of peritoneal inflammation to the nerveplexuses of the pelvis, leading to the occurrence of neuritis.

The development of a general neurosis in consequence of disease of the genital organs, either as a complication dependent upon the nervous stimulation excited by the primary disease, or as a reflex consequence of this disease, implies, as *Windscheid* strongly maintains, the existence prior to the occurrence of the disease of the genital organs of diminished power of resistance on the part of the nervous system. This neuropathic constitution may be the result of inheritance, and, according to *Engelhardt*, was so in 40 per cent. of his cases of women suffering from nervous disease secondary to the disease of the genital organs; or it may be acquired. Given this weakness of the nervous system, a local disturbance of the genital organs may act as the ultimate exciting cause of the onset of the neurosis in one of two different ways (*Windscheid*). "1. The stimulus which the nerves of the affected genital organ (or those

of some adjacent area, affected by direct extension) have received, proceeds upward from segment to segment of the spinal cord, and ultimately passes to the highest centres. 2. Or, on the other hand, the local nerves are not directly involved in the morbid process in the genital organs, but this latter acts as a source of reflex disturbance, a disturbance which must also pass through nervous channels. To this latter class of cases belong the instances, comparatively so frequent, in which, for example, a trifling retroflexion of the uterus must be regarded as the exciting cause of the neurosis." The commonest neurosis of those that may be excited by local disease of the genital organs is undoubtedly hysteria, next in frequency come chorea and epileptic seizures.

Schauta draws attention to the important fact that hereditarily predisposed, neurasthenic individuals bear very badly repeated gynecological examinations and long-continued local treatment, inasmuch as, in such persons, a notable increase in the severity of the nervous affection may result, and even the outbreak of actual mental disorder; and he further points out that in hereditarily predisposed individuals, psychoses not infrequently occur in consequence of the performance of gynecological operations.

The processes of pregnancy make a deep impression on woman's entire nervous system, and more especially on her mental functions. This is especially noticeable in the case of primiparæ. The fact is easily understood, for a woman is filled with expectation and anxiety concerning the unknown event, the complete revolution in her organization, the powerful impressions on her physical ego, the formation of a new being within her womb. How many joyful hopes, how many distressing fears, are connected with that which is about to take place, with the act of creation within her bosom; what changeful glimpses into the future, on the one hand the gladness, on the other the terror, of motherhood; often, also, the anxious doubts as to the probable sex of the newcomer. Consider, too, the stormy sensations experienced by a woman who, unmarried, has become pregnant contrary to her desires and expectations, especially one in a poverty-stricken condition—consider the agonizing thoughts in such a case regarding the consequences of giving birth to a child. It is only to be expected that in pregnant women in general there will almost always be increased irritability of the nervous system combined with a tendency to the rapid variation of emotional states. *Neumann* found, in almost all the pregnant women he examined in respect to the point, that there was an increase of the knee-jerks, as a manifestation of the general increase of nervous irritability. Nor does this change depend upon mental influences exclusively; there are other factors, such as the reflex

processes aroused by the enlargement of the uterus, and also the changes in the composition of the blood which occur during pregnancy, and cannot fail to have an influence on the nutrition of the brain. Finally, also, the deposit of carbonate of lime on the inner surfaces of the cranial bones (the parietal and frontal bones) which occurs during pregnancy, may be regarded as having some casual connection with the changes in the nervous system; and, again many authors assume that the cerebral circulation is influenced by the formation of the placental circulation.

The pathological consequences of pregnancy, as far as they affect the nervous system, take the form of neuralgia and of peripheral neuritis of various nerves, of chorea, of disturbances of the sense organs, and of actual psychoses.

Peripheral neuritis in pregnant women affects chiefly the lower extremities, but has been observed in the arms also; it is characterized by muscular wasting with reaction of degeneration, by trophic disturbances, and by disorders of sensation. A cure may ensue even during the pregnancy, but in other cases the illness persists until after parturition and on into the puerperium. To the same cause *Windscheid* assigns the paræsthesias of pregnancy, burning, prickling, and numb sensations of the finger-tips, less commonly of the toe-tips; these sensations are continuous, not paroxysmal, and cause very great suffering.

Pregnancy favors the occurrence of chorea, a circumstance explicable by the increased irritability of certain nerve centres characteristic of the pregnant woman. The chorea of pregnancy occurs for the most part in primiparæ, it is commoner in young than in older pregnant women, and appears especially in the early months of pregnancy. In the majority of cases the disease undergoes spontaneous cure before the end of the pregnancy, but cases with a fatal termination have been observed.

On the other hand, a curative influence in previously subsisting hysteria has been assigned to pregnancy. This in fact only occurs in cases in which the hysterical manifestations have been evoked by influences which are counteracted or removed by the occurrence of pregnancy, such, for instance, as intense longing to bear a child, dissatisfaction with the existing circumstances of married life, etc. Conversely, it is by no means unusual to observe that, in patients who have previously suffered from hysteria, the attacks become more frequent during pregnancy, and that other nervous disturbances associated with the hysteria become more prominent; hysterical paralysis, even, may appear. Very variable also is the influence of pregnancy in epileptics. Most commonly, indeed, a certain quiescence sets in, the attacks becoming less frequent and less severe;

but the reverse of this is at times observed. In the domain of the sense organs we observe amblyopia and hemianopia, deafness, and tinnitus aurium, and disorders of taste; all these appear as pure nervous disturbances without known anatomical basis (*Windscheid*).

Finally, among neuroses, tetany may be mentioned. In women, this disease occurs almost exclusively during pregnancy and the puerperal state, in the form of paroxysmal spasm, affecting chiefly the extremities, and especially the hands; the spasm is bilateral, tonic in character, and painful. The tetany of pregnancy usually runs a favourable course.

The slighter forms of mental disorder consist of perversions of taste and smell. Of actual psychoses occurring during pregnancy, the commonest forms are melancholia and mania. The former condition, which, according to *Ripping*, occurs in 84.4 per cent. of the cases, is usually very severe, and is characterized by a peculiar dreamy condition; it often leads to suicide, or to infanticide immediately after parturition. The psychoses of pregnancy are seen with greater frequency in the second half of pregnancy, they occur especially in primiparæ, and are also commoner in unmarried women. The prognosis is on the whole an unfavorable one; sometimes, indeed, the mental disorder terminates with the pregnancy, but in other cases it continues during the puerperium. Mental alienation occurring in the early months of pregnancy is apt to be less severe and to permit of a more favorable prognosis, than that which makes its appearance during the later months or at the end of the pregnancy.

In 32 cases of insanity of pregnancy recorded by *Ripping*, 8 cases occurred in the first pregnancy, 5 in the second, 6 in the third, 3 in the fourth, 4 in the fifth, 1 in the sixth, 1 in the seventh, 3 in the eighth, 1 in the tenth. Of these women

- 3 became affected in the 1st month⁴¹ of pregnancy.
- 4 became affected in the 2d month of pregnancy.
- 1 became affected in the 3d month of pregnancy.
- 2 became affected in the 4th month of pregnancy.
- 1 became affected in the 5th month of pregnancy.
- 0 became affected in the 6th month of pregnancy.
- 5 became affected in the 7th month of pregnancy.
- 5 became affected in the 8th month of pregnancy.
- 5 became affected in the 9th month of pregnancy.
- 6 became affected in the 10th month of pregnancy.

The neuralgias of pregnancy affect the most diverse nerve tracts, and may occur either spontaneously, without any discernible local exciting cause, or in consequence of the pressure exercised by the

⁴¹ It is usual of the Continent of Europe to divide the course of pregnancy into ten "months" of four weeks each. This fact must never be forgotten when comparisons are made between English and Continental tables, respectively, of the events of pregnancy.

enlarging uterus. To the former class of cases belong severe trigeminal neuralgia, the familiar toothache affecting quite sound teeth at the very beginning of pregnancy, intercostal neuralgia, and paroxysms of mastodynia. The pressure neuralgias affect chiefly the domain of the great sciatic nerve, manifesting themselves by the occurrence of pain down the back of the thigh, in the calf, and on the dorsum of the foot, sometimes associated with formication and other kinds of paræsthesia.

Parturition, by its powerful effect on the emotional nature in combination with intense physical suffering, may give rise to numerous nervous disturbances. The chief of these are, neuralgia, occasioned by the pressure of the foetal head as it passes through the pelvis of the mother, paræsthesias, convulsions, maniacal paroxysms, transitory mental alienation, cerebral hæmorrhages, and eclampsia.

The nervous disturbances dependent upon the processes of the puerperium are numerous and severe. According to *Windscheid*, four types of affection of the motor nerves may arise at this period. 1. Pressure-paralysis may occur in cases of generally contracted pelvis, or even in the absence of such contraction in cases of prolonged labor, from the pressure exercised by the child's head upon the intrapelvic nerves, and above all on the great sciatic nerve; pressure-paralysis may also result from obstetric operations, and especially from forceps delivery. The symptoms of pressure-paralysis consist chiefly of paralysis of the extensors of the feet and the toes; sensory symptoms are usually wanting. 2. Inflammatory infective paralyses, due to the extension to adjacent nerves of puerperal inflammation of the pelvic connective tissue. 3. Acute multiple neuritis, occurring either during the latter half of pregnancy or a few days after delivery, and affecting not only the nerves of the lower extremities, but those of remote regions, even the cranial nerves. 4. The rare puerperal hemiplegia due to cerebral hæmorrhage, occurring usually at the time the patient leaves her bed after delivery; puerperal hemiplegia may also arise from embolism consecutive to endocarditis, which may itself have originated before the termination of the pregnancy.

Other puerperal diseases of the nervous system requiring mention are, on the one hand, tetany, occurring during lactation, and permitting of a favorable prognosis, and on the other, the infective puerperal tetanus, the prognosis of which is exceedingly unfavorable. Finally, the puerperal state has to be considered as a factor in determining the onset of psychoses.

The puerperal psychoses are for the most part dependent upon the great loss of blood occurring during delivery, leading to anæmia and increased irritability of the brain, in association also with the

circulatory disturbances that arise in the central nervous organs in consequence of the sudden emptying of the abdomen by the act of childbirth; but additional causes of mental disorders are to be found in the changes in the composition of the blood that occur during pregnancy, and the influence of these changes upon the nutrition of the brain. Inherited predisposition plays its usual part in these cases; and accessory factors in producing mental disturbance during the puerperal state are to be found in puerperal infection, eclampsia, osteomalacia, and emotional shock.

Thus, for example, among 49 cases of puerperal psychoses, *Hansen* found that in 42 instances there was puerperal infection; and among 200 cases of puerperal eclampsia, *Olshausen* found 11 patients suffering from mental disorder. The principal forms of insanity occurring at the puerperium are mania and melancholia, next in frequency come monomania (Ger. *Verrücktheit*), dementia (Ger. *Blödsinn*), alternating or circular insanity (*folie circulaire*), hallucinatory paranoia (chronic delusional insanity with hallucinations), and hysterical mental disorder.

According to *Windscheid*, the commonest cases are those which are purely puerperal, the rarest those in which the insanity of pregnancy continues during the puerperal state; the age at which puerperal psychoses most commonly occur varies between 31 and 35 years, the average age being 29.1; multiparæ are more often affected than primiparæ; the outbreak of mental disorder most commonly occurs within a week after the birth of the child; there is nothing specific about the various forms of puerperal insanity, which are identical with the respective varieties owning another etiology. According to this author, before an attack of puerperal mania, prodromal symptoms usually occur, such as headache, dizziness (Ger. *Augenflimmern*), feelings of anxiety, insomnia, followed by various congestive symptoms, and either by great restlessness or by great apathy, and very often by indifference to the infant; to these symptoms succeeds the period of motor excitability, characterized by great bodily restlessness and by continued talkativeness; the culmination takes the form of a maniacal outburst, in which infanticide even may occur; the delirium runs mostly in erotic and religious channels. Puerperal melancholia also exhibits the usual clinical picture of this form of mental disorder; after prodromal headache, stupor sets in, often associated with attacks of anxiety and with hallucinations of sense, and always characterized by great loss of appetite and by a suicidal tendency.

In relation to the puerperal psychoses, it appears that the first menstruation after the birth of the child has, like the very first appearance of the menstrual flow during the menarche, a tendency

to favor the onset of mental disorder. According to *Marcé*, this first post-puerperal menstruation has a very definite significance in the causation of psychoses. Among forty-four cases of puerperal psychoses, there were eleven instances in which the mental disorder made its appearance six weeks after childbirth, exactly at the moment, that is to say, in which, had the mothers not given suck to their children, menstruation ought to have reappeared. In those who did not nurse their infants, and in whom menstruation recommenced at the due date, the psychosis usually began on the first day of menstruation, less often on the fourth or fifth day. In some instances the psychosis appeared at the time at which menstruation might have been expected to occur, but when the flow was still in abeyance. And in some women who suckled their children for a time and then weaned them, the psychosis made its appearance at the time of the first recurrence of menstruation.

Among diseases of the sense-organs occurring during the menacme, ocular lesions are by no means rare as sequels of pathological changes in the genital organs. Thus, in cases of displacements of the uterus, especially prolapse, retroflexion, and retroversion, we sometimes see retinal hyperæsthesia and reflex amblyopia, photophobia and lachrymation, and accommodative or muscular asthenopia. Inflammation of the pelvic connective tissue, perimetritic and parametritic exudations, and especially parametritis atrophicans, may give rise to functional disorders of the eye, reflex hyperæmia of the trigeminal and optic nerves, various painful sensations, and photophobia. Severe metrorrhagia may also cause disturbances of vision, either by inducing local anæmia and consequent functional failure of the nervous apparatus, or by leading to serious infiltration of the optic nerve which manifests itself also in the retina in the form of a transudation. In cases alike of congenital and of acquired atrophy of the uterus, and frequently, therefore, in sterile women, optic nerve atrophy may occur.

COMPETENCE FOR MARRIAGE OF WOMEN SUFFERING FROM DISEASE.

In this section we must consider the competence for marriage of women suffering from heart disease, of those suffering from hereditary tendency to mental disorders and neurasthenic states, and, finally, of those affected with tuberculosis.

Every doctor is confronted during the practice of his profession by the problem whether a young woman known to suffer from heart disease is justified in entering upon marriage and in exposing herself to the dangers entailed on her diseased heart by copulation, pregnancy, parturition, and the puerperium. The solution of this problem is as important as it is difficult. On the one hand, it de-

termines the whole future course of a human life which is still ascending the upward path of its vital career, and a negative decision often annuls in a moment the young woman's ideals and hopes; on the other hand, an affirmative decision involves the responsibility for the consequences of marriage, often grave in these cases.

The consequences are in fact apt to be very serious indeed. The normal act of intercourse, in a young and sensitive woman, has already an exciting influence on the nerve apparatus by which the movements of the heart are controlled. The frequency of the heart's action is greatly increased, the cardiac impulse becomes much stronger, there is marked pulsation of the peripheral arteries, the conjunctiva is injected, the respiration more frequent. These manifestations, which normally are quite transient, attain a greater intensity and exhibit a longer duration in persons affected with heart disease. In some instances, violent tachycardial paroxysms occur, with considerable dyspnœa, pains in the cardiac region, headache, and even syncopal attacks.

Pregnancy, in consequence of the extensive changes undergone not only by the reproductive apparatus but also by the general system, and further in consequence of the vital needs of the developing embryo, involves extensive claims upon the cardiac activity. It is easy to understand that the diseased heart must be taxed more severely than the healthy heart by the extension of existing vascular areas, the addition of new vascular areas, and the increase in the quantity of the blood, during pregnancy; and it is not surprising if the over-taxed organ threatens sometimes to give way under the strain. Thus, during pregnancy in women affected with morbus cordis, we observe numerous troubles in the way of disturbances of cardiac activity and passive congestion of various organs, culminating at times in abortion.

Parturition and the puerperium, moreover, bring several factors into play which tend to affect unfavorably even a heart that is quite normal; and in cases in which there is disease either of the heart or of the great vessels, these factors may lead to the occurrence of most alarming symptoms. In this connection we may refer to endocarditis, to fatty degeneration of the myocardium, and to the rupture of atheromatous arteries.

From the time of *Galen* onwards all medical writers have agreed that the heart is unfavorably influenced by pregnancy and its consequences—but from this incontestible proposition to deduce the general conclusion that young women affected with heart disease must be forbidden to marry is in my opinion too great a jump, and altogether too sweeping a statement. The apophthegm of *Peters*, an

author to whom we are certainly indebted for some of our knowledge of the *accidents gravido-cardiaques*, that in the case of women suffering from morbus cordis the rule must be enforced, *fille pas de mariage, femme pas de grossesse, mère pas d'allaitement*, has a fine air of apodictic brevity, but is entirely devoid of justification. No such rigid prohibition is advanced by recent writers on heart disease, such as *Huchard, von Leyden, and Rosenbach*; not, at least, without qualifications.

The question as to the permissibility of marriage to girls and women affected with heart disease cannot, in fact, be answered by any general proposition; and each case demands separate inquiry and a careful balancing of individual considerations. I have known cases in which the marriage of young girls suffering from morbus cordis was equivalent to a sentence of death, the execution of which was delayed for a few months only. On the other hand, I have known many women belonging to the upper classes and suffering from cardiac defects to pass through numerous pregnancies and to give birth to a number of children with no more than trifling disturbances of compensation. I am acquainted with a lady who when a young girl was urgently advised against marriage, on account of extensive aortic valvular incompetency, by two celebrated physicians. The advice was disregarded, and this lady is now the mother of four children, the eldest of whom is twenty-two years of age, and her general condition is in no way worse than it was before her marriage. The dangers of marriage in women suffering from morbus cordis are in my opinion generally overrated.

The degree to which a woman affected with heart disease will be injured by married life, will depend on the nature of the cardiac affection, on the time it has already existed, on the adequacy of compensation or the intensity of existing disturbances of compensation, on the general state of nutrition of the patient, on the more or less favorable social position, and on the manner in which sexual intercourse is regulated.

My own opinions in respect of this question may be summed up as follows: A woman who has comparatively recently (within a few years) acquired a valvular defect, and in whom the disease has run such a course that, in consequence of dilatation of certain chambers of the heart and of hypertrophy of those segments of the myocardium on which increased work has been thrown, and thus in consequence of adaptation of the cardio-vascular apparatus to the new conditions, the circulation and distribution of the blood take place in a manner closely resembling that in which these functions are effected in a normal, healthy individual—in a word, a woman in whom the valvular disease appears to be adequately com-

pensated,—if, in addition, the patient is well nourished, if the hæmatopoietic function has not undergone any notable disturbance, if the muscular system is powerful and the nervous system possesses sufficient power of resistance—then marriage may be permitted without hesitation. In the case of such a girl or woman, we can confidently assume that the adequate compensation of the valvular disease will enable the heart to meet with success the claims made upon its reserve energies by sexual intercourse, by pregnancy, and by parturition, and that these processes will not involve any excessive danger to life.

A woman with valvular heart disease, even when that disease is well compensated, will indeed during pregnancy and still more during parturition and the early days of the puerperium, be liable to suffer from various manifestations of cardiac disorder. The action of her heart will be subject to paroxysmal increase in frequency and force, sometimes also there may be transient attacks of cardiac asthenia; at the same time the breathing will become more frequent and deeper, and occasionally, even, there may be severe dyspnœa. Perhaps also symptoms of venous congestion may manifest themselves, digestive disturbances, sense of pressure in the head, swelling of the feet, œdema of the abdominal wall, even slight albuminuria. Just after childbirth, moreover, an abnormally intense depression of the circulation with infrequency of the heart's action will be liable to ensue. In the great majority of cases, however, in which the conditions detailed above are fulfilled, the disturbances of compensation occasioned by pregnancy and the puerperal state will not seriously threaten life; and as soon as the puerperal period has been safely passed through, the heart will again be competent for its duties and will do its work as well as before.

These statements apply, not only to cases of well-compensated valvular disease, especially mitral insufficiency, mitral stenosis, and aortic insufficiency, but also to cases in which the heart has made a good recovery after an attack of pericarditis, and to cases of moderately extensive disease of the myocardium consequent on acute articular rheumatism or the acute infections.

As indispensable conditions for such a favorable prognosis, we naturally assume that the pregnant woman is in a position to command the extreme bodily care that in her condition is doubly needful, that she is able to avoid all severe physical exertion, and that she will be subjected to continuous medical supervision in respect of the adoption of suitable dietetic and hygienic measures.

Such a favorable prospect as regards marriage in cases of well-compensated heart disease will, however, be clouded in the case of women who are either very anæmic or predisposed to nervous disorders; nor is the prognosis favorable as regards women in whom the heart disease is either congenital, or acquired in early youth, or

as regards women contemplating marriage when already well up in years.

For in very anæmic women, even when the heart is quite sound, frequently recurring attacks of tachycardia often occur during pregnancy, in the absence of any obvious exciting cause; œdema of the lower extremities, and the formation of extensive varices, are also common. Increased nervous reflex irritability has also an unfavorable influence upon cardiac innervation. In cases, again, in which the heart disease is of long standing, the functional capacity of the heart is so notably depressed that the organ is likely to prove incompetent to meet the increased demands made upon it by the processes of pregnancy. Finally, in elderly women, superadded to the valvular defects, we have the dangers dependent upon the already beginning arteriosclerotic changes in the blood-vessels. In all such cases, therefore, it will be the duty of the physician to advise his patient not to marry; and in any case to impress upon her mind the extreme probability, amounting almost to certainty, of serious aggravation of the heart disease by marriage, with permanent impairment of the general health.

In cases of valvular disease accompanied by serious disturbances of compensation, and in cases of notable degeneration of the myocardium in which pronounced symptoms of cardiac muscular insufficiency have made their appearance, marriage must be absolutely forbidden, as directly imperilling life. When even moderate bodily exertion suffices to cause palpitation, increased frequency of the pulse, and shortness of breath, when extensive œdema of the lower extremities is present and fails to disappear even after the patient has been strictly confined to bed, when the pulse very readily becomes irregular both in rhythm and force, whilst the urine is often scanty and contains variable quantities of albumin, when conditions of cardiac asthenia readily arise, characterized by a small, irregular pulse, coldness of the extremities, cyanotic tint, nausea, respiratory need,⁴² and syncopal attacks—in all such cases, whether the symptoms just described are dependent upon valvular defects, upon pathological changes in the arteries, or upon diseases of the myocardium, in all alike the occurrence of pregnancy is a true disaster, which in the vast majority of cases causes a great and enduring aggravation of the disease, and frequently enough costs the patient her life.

Even in such cases as were previously described, in which, the heart disease not being severe, the patient was told that marriage was permissible, it is the duty of the physician to lay down certain rigid rules regarding sexual activity.

Women suffering from heart disease should not have sexual in-

⁴² Ger. *Lufthunger*.

tercourse frequently, because, if the peripheral nervous stimulation of the genital organs is excessive in consequence of too frequent acts of coitus, cardiac activity is likely to be influenced powerfully in a reflex manner, leading to the occurrence of attacks of cardiac asthenia. Again, sexual intercourse must always be effected in such a manner that the act attains its physiological conclusion, and that in the woman as well as in the man the orgasm has its normal outcome, that is to say that at the conclusion of the act the woman's cervical glands are evacuated with the accompaniment of the sense of ejaculation. The *congressus interruptus*, which precisely in these cases in which the wife suffers from heart disease is so frequently practiced by the husband with a view to preventing conception, must be strictly forbidden, since this mode of intercourse tends to give rise to various forms of reflex cardiac disturbance, most commonly to paroxysms in which the cardiac action becomes unduly frequent, in association with diminution of vascular tone, vasomotor disturbances, and states of mental depression; and where organic heart disease already exists, these reflex functional disturbances involve various dangers.

The physician is further justified in advising that a woman with organic heart disease should not give birth to more than one or two children. This advice is the more needful for the reason that with each successive pregnancy the functional capacity of the woman's diseased heart diminishes according to a geometrical ratio, and to a corresponding degree the danger to life increases. These are cases in which in my opinion it is the physician's duty to concern himself with the subject—in general so equivocal—of the use of preventive measures, and, having regard for the preservation of a woman's life, and uninfluenced by any false delicacy, but with moral earnestness, to inform his patient with respect to the needful prophylactic measures. The artificial termination of pregnancy, which unquestionably is often justified in women suffering from heart disease, but which unfortunately is apt to have very unfavorable results, will rarely need to be discussed if by the proper employment of preventive measures care is taken that pregnancy does not recur too frequently.

To enable us to answer the question whether, in the case of neurasthenic and hysterical young women, and in those hereditarily predisposed to the occurrence of mental disorders, the physician shall advise for or against marriage, attention must in the first instance be directed to the established facts relating to the favorable or unfavorable influence, as the case may be, of sexual intercourse and its consequences (pregnancy and childbirth) upon existing nervous disorders and upon the predisposition to their occurrence.

Without regarding as fully justified the opinion that in the female sex sexual abstinence has in all circumstances an unfavorable influence upon the nervous system or even that such abstinence is to be regarded as the principal cause of nervous and hysterical troubles, we must consider it fully proved that in a number of the commonest varieties of nervous disease occurring in neurasthenically predisposed subjects, such as neurasthenia, hysteria and neurosis of anxiety*, the lack of sexual satisfaction aggravates these troubles, whilst suitably regulated sexual intercourse has an actively beneficial effect. Not, indeed, that it is an infallible means, but none the less the effects are often striking, as I have frequently had occasion to observe, both in young women so affected entering upon marriage for the first time, and also in young widows who have remarried. Especially is this true of women in whom the sexual impulse is exceedingly powerful, and even pathologically increased to the extent of marked sexual hyperæsthesia; likewise also in women whose social circumstances and manner of life induce increased sexual appetite. Be it understood, I refer here to regular and moderate sexual intercourse, and not to sexual excesses, which latter, by inducing nervous exhaustion, may have a distinctly deleterious effect. In many cases, however, we observe in women suffering from sexual neurasthenia, that sexual intercourse, even when practiced at long intervals, gives rise to nervous prostration with deep emotional depression and long-lasting aggravation of the existing nervous disorder. This statement applies with especial force to very hysterical epileptic girls with hereditary predisposition to mental disorder.

From the fact that among persons hereditarily predisposed to mental disorder, the unmarried are on the average more often affected with insanity than the married, the inference has been drawn that marriage may be recommended to such persons as a measure likely to counteract their hereditary tendency to insanity. The argument, however, lacks validity, more especially as regards women; among whom, moreover, from the age of sixteen to the age of thirty, insanity is proportionately more prevalent among the married, though above the age of thirty it is more prevalent among the unmarried.

In the great majority of neurasthenic women, normal sexual intercourse, practiced in moderation, has, according to *Löwenfeld*, no deleterious effect; often, indeed, as a consequence of unaccustomed abstinence, an aggravation of existing nervous troubles may be observed. But, as this author maintains, nervous exhaustion may result in the complete disappearance of the orgasm during sexual intercourse, or in great difficulty in its production; this circumstance suffices for the

* See note 36 on p. 225.

most part to explain the fact that in women suffering from great depression of the nervous functions, the fulfilment of their sexual duties has sometimes an unfavorable influence on their general condition. As regards hysteria, it cannot be denied, that in many hysterical women marriage results in a favorable change in the general condition; we must, however, be careful not to overrate the significance of such observations. As a rule all that actually takes place is a diminution in the intensity or even a disappearance of certain morbid manifestations previously present, without, however, an eradication of the hysterical temperament.

In epileptic young women, the first experience of sexual intercourse may precipitate a fit. Cases are indeed on record in which, in hereditarily predisposed girls, the first coitus was the exciting cause of the first epileptic fit, the fits recurring every time sexual intercourse was repeated.

It is a comparatively frequent occurrence in psychopathically predisposed girls for severe mental disturbances to make their appearance during the honeymoon, after the first experience of sexual intercourse; when this occurs, it is doubtless to be accounted for by the combined influence upon the mind of all the changes in the circumstances of life which have resulted from the marriage. In the case of two newly-married women, one of whom had well-marked hereditary predisposition, whilst in the other there was no known family history of mental disorder, *Löwenfeld* observed shortly after marriage the onset of severe melancholia, with refusal of food. The delicate, nervous temperament of these two women, on the one hand, and, on the other, possibly, a somewhat too eager and passionate attitude on the part of their respective husbands, led their first experience of sexual intercourse to result in a nervous impression of the nature of shock, which their nervous system was too weak to resist.

Frequently recurring pregnancy and childbirth may, according to *Krönig*, act as the predisposing cause in the production of neurasthenia. In regard to hysteria also we must admit that the onset of some disease of the organs of generation frequently leads previously latent hysteria to manifest itself openly, and further we have to recognize that diseases of the reproductive system often give the clinical picture of hysteria a quite distinctive coloration; the physiological course of the functions of the generative organs is also competent to produce both of these effects. *Krönig*, however, rejects the view that the lack of sexual intercourse has an unfavorable influence upon the nervous system in women, and gives rise to hysterical and neurasthenic disorders. The favorable influence which marriage is often observed to exercise upon the course of nervous disorders is explicable with reference to psychical considera-

tions of a very different nature. Sexual abuses, masturbation, and the use of preventive measures, give rise in women far less often than in men to neurasthenic and hysterical conditions.

Féré asserts that in certain neurasthenic patients sexual intercourse induces a general blunting of the senses, and especially of hearing and sight. Actual amaurosis of short duration may even be observed; also cutaneous anæsthesias, paralytic conditions of the extremities taking the form either of hemiplegia or paraplegia, convulsive attacks, and somnolent paroxysms.

Delasiauve observed that epileptic patients, who during residence in an asylum had remained almost entirely free from fits, after returning home and resuming sexual intercourse, even in strict moderation, suffered from a recrudescence of the convulsive seizures; when intercourse was excessive, the relapse was naturally even more severe.

In two instances, in women who in a single night had practiced intercourse to very great excess, *Hammond* observed paralysis of both legs to ensue; he saw also in numerous cases spinal irritation and other nervous disturbances as a consequence of sexual excesses.

Von Krafft-Ebing points out, with reference to the prophylactic influence of marriage in respect of mental disorder, that in men early marriage diminishes the danger of the occurrence of such disorder, whereas in women marriage is undesirable before the attainment of complete physical maturity.

With regard to marriage in the case of persons suffering from nervous diseases, *Ribbing* lays down the rule that when such diseases have been severe and have occurred in numerous members of a family, whilst a few only in the family have remained healthy, when, moreover, the illness has been accustomed to make its first appearance only after the attainment of maturity, no indications of its onset being noticeable in childhood or youth—one belonging to a family thus afflicted should be advised not to marry. Where, however, the hereditary tendency is to a disease likely to manifest itself in childhood or youth, a member of such a family who has been fortunate enough to pass through the years of development without exhibiting any pronounced disturbance of the nervous system, may be permitted to marry if certain precautions are observed. A woman with a tendency to alcoholism should in no circumstances be allowed to marry. In the cases, fortunately rare, in which the drink-craving exists in women, marriage is even more undesirable than it is in the case of men similarly afflicted, for the female drunkard is in a position in which she can mishandle and neglect her children throughout the entire day; and, moreover, this affection appears to be even more obstinately incurable in women than it is in men.

Löwenfeld very rightly insists that in deciding on the advisability of marriage in the case of neurasthenic and hysterical girls the anticipated influence of sexual intercourse must not be the sole determinant. "Regulated sexual intercourse, such as is rendered possible by marriage, has often a favorable influence on previously existing states of nervous weakness. But we should go too far if we were to attribute the beneficial effect of married life on such conditions solely to sexual intercourse. This latter is but one factor among several, the others being no less important. These others are: The pleasures of an orderly domestic activity; the withdrawal of the patient's attention from her own condition, partly by domestic duties and difficulties, and partly by the novelty of marital companionship; the gratification, especially strong in women, at having obtained a support in life; and, finally, the joyful expectation of motherhood. These factors, however, are not present in every marriage. When their presence cannot reasonably be anticipated, when, in consequence of insufficient means, the marriage is likely to entail increasing troubles, or when, owing to the want of suitability of temperament, annoyances and quarrels are likely to occur, we must throw the weight of our advice into the scale against the proposed marriage, since the advantages of regulated sexual intercourse are not likely to outweigh the disadvantages just detailed. Even when means are ample and the characters of the couple contemplating marriage are unquestionably harmonious, we must nevertheless (temporarily, at any rate) advise against marriage, we must, that is to say, advise the postponement of marriage, if the bride is suffering from severe hysterical or neurasthenic states. Where, further, such neurasthenic or hysterical troubles occur in a woman with pronounced hereditary predisposition to nervous disease, we must, both for the sake of the possible progeny and on account of the uncertain influence of married life on the health of the patient, absolutely and unconditionally prohibit marriage. In cases also in which severe hereditary predisposition to mental disorder exists (especially when derived from both parents), and in addition stigmata of psychopathic degeneration are actually apparent in the patient, or she has already suffered from the development of a psychosis, we must decisively object to the patient's marriage."

As regards the marriage of young women suffering from tuberculosis, we must take into consideration a fact that medical experience has conclusively established, namely, that the processes of generation have an unfavorable influence upon pulmonary phthisis. Girls with an inherited predisposition to tubercular disease, sometimes first manifest the symptoms of pulmonary tuberculosis at the time of the menarche. In cases of developed tuberculosis, copulation

and the excitement of the vascular system associated therewith have a more or less unfavorable influence—and all the more inasmuch as, in accordance with the saying *omnis phthisicus salax*, women affected with tuberculosis often exhibit a very lively sexual impulse, an almost insatiable sexual appetite. Sexual excesses are, moreover, very likely to lead to the occurrence of hæmoptysis.

In former days it was believed that conception and pregnancy, when occurring in women suffering from tuberculosis, had a restraining influence on the progress of the pulmonary disease, a view which found expression in the assertion of *Baumès* and *Rozières de la Chassagne* that of two women affected with tuberculosis to the same degree of severity, one who became pregnant would always outlive the other who failed to become so. Careful and sufficient observations on the part of physicians and gynecologists have, however, shown that this view was fallacious, and, on the contrary, that during pregnancy tuberculosis advances with more rapid strides, that pregnancy, and lying-in accelerate the fatal event (*Grisolle, Lebert*), that tuberculosis acquired shortly before pregnancy or in the course of that condition, progresses with exceptional rapidity (*Larcher*), and that the lying-in period is especially perilous to these patients (*A. Hanau*). In some cases of consumption it is the first pregnancy that is the most perilous, but in other cases a later pregnancy proves more destructive.

Ribbing goes even further, insisting that neither man nor woman affected with pulmonary consumption should marry. "If, indeed," he writes, "consumptives desire to enter upon marriage, merely with the aim of being faithful to one another and assisting one another for the short time that remains to them, I should offer no opposition. But there must be a complete mutual understanding of the facts of the case, and an unalterable determination on the part of both to carry out the resolutions made prior to marriage, for failing this the consequences will be most disastrous. In most cases, however, the course adopted by *Bulwer's Pilgrims of the Rhine* is to be preferred, the lovers contenting themselves with the condition of a betrothed pair, and in that state awaiting the approach of death—or, if exceptionally fortunate, proceeding to marriage only after restoration to health."

It would certainly appear that in the case of girls suffering from pronounced phthisis, we are justified in advising against marriage, on account of the great danger which this state entails of a rapid advance in the pulmonary disease.

Based upon the observations of *Schauta* and *Fellner*, the latter author advances the rule that in the case of a woman suffering from disease, marriage should be forbidden only when the mortality from

the disease in question is not less than 10 per cent. In this category we must include severe cases only of pulmonary tuberculosis; whilst cases of laryngeal tuberculosis will, according to this rule, be absolutely unfitted for marriage. Among heart-affections contra-indicating marriage, he includes mitral stenosis, other valvular affections in which there is serious disturbance of compensation, and myocarditis; he considers marriage inadmissible also in cases of chronic nephritis, and, among surgical affections, in cases of malignant tumour. In cases in which during a previous pregnancy the patient has been affected by one of the following diseases, viz., severe chorea, mental disorders, severe epilepsy, pulmonary tuberculosis which progressed much during the pregnancy, morbus cordis with considerable disturbance of compensation, severe heart trouble due to Graves' disease—in all such cases, a repetition of pregnancy should be avoided.

HYGIENE DURING THE MENACME.

During the sexual epoch of the menacme a woman's principal hygienic need is marriage completely satisfactory alike to body and to mind. It cannot be denied that sufficient sexual gratification, regular, of course, and free from all excess, such as is usually experienced in married life, is very advantageous to the health of a woman who has attained sexual maturity—even though we admit that the drawbacks of sexual abstinence, regarded as a cause of disease of the female genital organs and the nervous system have been as a rule greatly exaggerated.

The inability to marry always makes a deep impression on the mental life of woman, and in many cases also gives rise to burning desire and tormenting yearning of an erotic nature. The unmarried miss life's true goal and fail to enjoy the natural exercise of their functional capacities; alike in the cultured lady and in the poor working woman who has failed to marry, the thoughts and feelings return again and again to her own condition in a self-tormenting manner.

The physical and mental disadvantages entailed by sexual gratification when obtained by an unmarried woman, one who, according to modern phraseology, "wishes to secure her natural share of the joys of love," and who regards voluntary chastity as "a sacrifice to meaningless prejudices"—need not be more particularly described.

Free love, moreover, is the most important disseminator of gonorrhœal infection. "In any future commonwealth," says *Runge*, "in which marriage is abandoned in favour of the general practice of free love, the human race will be overwhelmed by gonococci in a manner now hardly conceivable, and the reproductive capacity in

both sexes will be diminished by the results of gonorrhœa to a very serious extent."

Frequently enough, also, free love leads to prostitution, which at the present day is so widely prevalent. Various reasons have been suggested to account for the increase of prostitution. Among these are: The growth of modern industry, with the consequent aggregation of the population in large towns; the decline in the marriage rate; the postponement of marriage; universal military service; the freer mutual companionship of the sexes; and many others. At any rate, the fact would appear to be established, that in the case of woman the determining cause of prostitution is hunger rather than the sexual impulse. The worst paid classes of workwomen are shown by official statistics to furnish the largest number of recruits to the ranks of prostitutes; and it is during times of deficient employment that the number of women practicing occasional prostitution increases. Thus, material need is the most important of the causes of prostitution.

This remains true even though the doctrine of *Lombroso* and *Tarnowsky* should find fuller justification, the doctrine that the practice of prostitution by women is the natural expression of a congenital morbid predisposition, "which impels them, in defiance of their direct advantage, of reason, and of all counter-advice, to adopt this accursed mode of life." Prostitution, in this view, is to be regarded as the inevitable outcome of congenital moral insanity. This is certainly true of a small proportion of prostitutes, but is as certainly false of the great majority, in whom unfavorable, difficult conditions of life form the determining cause. A certain inherited or acquired mental disposition may, indeed, be assumed to exist in these cases also—an unstable moral equilibrium, an insufficient development of the force of the will and of the power of resistance.

The hygienic requirement of married life for woman during the menacme is undoubtedly sometimes hard to fulfil in our day, when the more elaborate and expensive standard of life has increased the difficulty of supporting a family; but from the medical point of view it is necessary to insist forcibly on this categorical imperative, in opposition to the view advanced by the modern women's rights' party, that "love is moral also in the absence of legal marriage" (*Ellen Key*); in opposition to the yet more extreme opinion of *George Sand* and of *Almqvist*, who, regardless of consequences, declare marriage to be immoral; and, finally, in opposition to the advocates of "free love," who wish woman to be as free as man in sexual relations.

Much as we may wish that man and wife should be in complete harmony in marriage, and that they should feel themselves to be

firmly united alike by mutual love and by a reciprocal sense of duty, none the less we must consider the modern maiden ripe for marriage as unjustified in demanding, before undertaking marriage, "perfect love as typifying the inner yearning of two beings to become one;" and we must regard the latter-day woman as extravagant in insisting that the man shall enter upon marriage in a condition as virgin as that of his contemplated wife. "Perfect love" is as rare and as little to be expected as perfect beauty; and the sexual life of man differs entirely in nature and in the course of its development from the sexual activity of women.

Doubtless they spring deep from the soul of woman, the demands expressed by the writer of the book "*Vera*," and by her numerous imitators, the apostles of "Veraism,"—the demands of the maiden entering upon marriage that her husband shall be as chaste and sexually as unspotted as herself. Difficult of fulfilment as they are, if fulfilment is even possible, these demands must none the less be regarded as characteristic of the sexual life of modern womanhood. "Is man's sexual honor," exclaims *Vera*, "then altogether different from that of woman? Is not the alleged necessity for sexual gratification in youth either a well-organized fraud or an enormous error on the part of physicians? Is it possible that chastity can entail diseases as terrible, as destructive to life and happiness as those that result from unchastity? And is it not a crying sin, even if some of these fears are justified, to ruin both mentally and physically the whole race of women? * * * Man demands from the girl of his choice, not chastity alone, but an absolutely unblemished character. And rightly so. But the wife must share her husband with street-walkers? She must bear the pangs of maternity, while fortified by the terrible knowledge that the father of her children has wasted his youthful virility in purchased embraces, that he has not recoiled from impurity, that he has exposed himself to the risk of infection with the most horrible diseases, that he has squandered his virginity in the most bestial sensuality? * * * We girls must also be granted the right to demand from the man of our choice the same purity, the same unspottedness by sensuality, that he so rigorously demands from ourselves! We must no longer content ourselves with the remnants that are left for us by others! We must no longer be satisfied with man's moral inferiority! Then there will be more happiness, more love, more health and joy of life!"

These accusations and demands so boldly made are not to be disposed of by mere mockery. With deep sorrow we must admit the absolute truth of the charge that too many men clamber out of the abyss of debauchery to a blighted marriage. But the demand

for equal moral rights, for the abandonment of the hitherto prevalent bisexual ethical standards, is in vain conflict with actuality, with the defensive instincts of young men, with the difficulties entailed by the struggle for existence, with the increasing pretensions (to sexual freedom) of women themselves; but above all is it in conflict with the thousand-year-old notions of sexual honor in the male and the female respectively, and with the undeniable fact that the mature man is capable of elevating himself out of the base intoxication of the senses characteristic of youth, to attain the noblest and most intimate married love, whereas the girl who has once descended into such an abyss sinks therein and is beyond the possibility of rescue. Thus early marriage with equal purity of husband and wife remains a postulate which the present can hardly be expected to satisfy, and one whose fulfilment must be left to the future.

In consequence of modern writings and discussions concerning the erotic problem, there has arisen a hypersensibility on the part of women in respect of the conditions in which they pass their married life, leading them to demand greater independence, a greater expansion of their own individuality; this tendency must, however, be resisted, if the marriage is to be a happy one, with mutual comfort and reciprocal consideration, one suitable, not for exceptional beings in an ideal state, but for men and women as they really are. In such a marriage, affection and a sense of duty will strengthen love and preserve fidelity. A prudent, clever woman will always understand how, notwithstanding all necessary self-surrender, to preserve the freedom of her own individuality and the esteem of her husband.

Marriages based upon true inclination usually result in the birth of stronger and more beautiful children than marriages in which the money-bags were the sole or the principal determining cause. In England, where people commonly marry when still quite young, beautiful and healthy children are more often seen than in France, where marriages of expediency form the great majority. According to *Bertillon*, of 1,000 young men from 20 to 25 years of age, in England 120 marry, but in France less than half that number, viz., 57 only. And 100 wives between the ages of 15 and 40 give birth annually, in England to 39 children, in France to 26 only, a number less by one-third.

In deciding upon marriage, hereditary influences deserve careful consideration in respect alike of the family of the prospective husband and that of the prospective wife. For it is well established that the law of inheritance relates not only to the peculiarities of external configuration, to the features, the stature, the tint of the skin, but also that children inherit from their parents their mode of bodily development, the functional activity of their organs, the dura-

tion of their life, their predisposition to disease, and even their intellectual and moral qualities. As regards hereditary predisposition to disease, the most important are, as is well known, the predisposition to tuberculosis, that to malignant tumors, and that to mental disorders.

Great disparity in the respective ages of prospective husband and wife entail various kinds of unsuitability for marriage. An elderly man who marries a young girl, even if he still possesses a certain amount of virility, is unlikely to procreate healthy and powerful children; and these latter for the most part will be weakly, scrofulous cachectic, endowed with deficient powers of resistance, and often badly equipped from the intellectual standpoint. Similar considerations prevail in respect of marriages in which the husband has been exhausted by earlier sexual excesses, so that he retains no more than remnants of virility, whilst his semen is of doubtful fertilizing power. *D. Richard* relates that Louis XIV asked his physician why it was that the children he (the king) had by his wife were delicate and deformed, whilst those he had by his mistresses were beautiful and powerful. "Sire," was the answer, "c'est parce que vous ne donnez à la reine que les rincures."

Plato maintains that before every marriage the man and the woman should both undergo official examination to determine their fitness or unfitness for the married state, the man being absolutely nude, and the woman stripped to the waist, for the examination. This author goes so far as to regard it as "a form of homicide for a man to embrace a woman when he is incapable of fertilizing her." How rarely it happens in our day, however, that the physician, the official with the requisite knowledge to fulfil *Plato's* requirements, is asked for his opinion regarding the desirability of a contemplated marriage! The only occasion on which this is likely to occur is when a man intending to marry wishes to be assured that he is completely cured from an earlier infection with syphilis, and, therefore, runs no risk of transmitting the disease to his wife or to possible offspring. But it never occurs to the parents of a girl about to marry to ask the physician whether she is physically suitable for marriage.

In deciding on marriage, however, care should before all be taken to determine that the girl has attained complete physical and especially complete sexual development. The age at which woman attains complete sexual maturity is in our climate and race coincident on the average with the twentieth year of life.

For the hygiene of marriage it is necessary that the bride should not be extremely youthful. Notwithstanding the fact that the legal codes of civilized countries nowhere demand for girls a greater age

than fifteen years before permitting marriage, this limit is, generally speaking, fixed far too low. Before becoming a wife, the girl should not merely have attained complete physical development, with her reproductive organs in a state of maturity, but she must also be developed intellectually to such an extent that she is fully capable of understanding the nature and significance of marriage. At the age at which marriage is legally permissible, a girl is still far from having attained physical and mental ripeness for marriage, reproduction, and maternity.

Especially with reference to the last consideration is it inadvisable that in our climates a girl should marry earlier than from 18 to 20 years of age, and preferably even she should first attain the age of from 20 to 22. In that case her happiness as a mother will be more secure, and there will be a greater probability of her producing a healthy progeny. In the East, indeed, quite different views prevail. According to the laws of *Manus*, a girl might marry on attaining the age of eight years; if within three years thereafter her father failed to provide her with a husband, she might choose one for herself. Among the Hindus it is regarded as a disgrace to the parents if a girl does not marry quite young, indeed before the first appearance of menstruation. *Atri* and *Kasyapa* state that if a girl begins to menstruate before she leaves her father's house, the latter must be punished as if he had destroyed a foetus, while the daughter herself loses caste. Marriage delayed till after the appearance of menstruation being regarded as sinful, girls are married while still children, in order to prevent the loss of mature ova, which is regarded as equivalent to infanticide. Very early marriage has thus in India been legally ordained for thousands of years. The Hindus, who even now regard every menstruation which has not been preceded by coitus in the light of infanticide, marry their daughters before the age of puberty.

According to oriental tradition, Mahomet married Khadijah when five years of age, and cohabited with her three years later. In the Bible, numerous similar examples are recorded. Among many savage tribes, as, for instance, among some of the aborigines of India, and among the indigens of Australia, copulation is usually effected before girls reach the age of puberty; in India, indeed, according to *Ploss* and *Bartels* (*Das Weib in der Natur und Völkerkunde*), marriage with immature girls is a widely diffused custom, and in Australia a child of ten or eleven is often found to be the wife of a man of fifty or the concubine of a sailor. In general, according to these authors, we find that the age of nubility in girls is lower in proportion to the lowness of the stage of civilization attained by the race or people to which they belong. Among the

ancient Romans, girls were commonly married between the ages of thirteen and sixteen years.

In the Talmud, *Rabbi Joshua* gives the following advice regarding early marriage in Jewish girls: "If your daughter has attained puberty and is twelve years and six months old, she must be married at any cost. If no other means are available, manumit one of your slaves, and give her to the freedman to wife."

Experience proves, however, that in our climate, at any rate, girls who marry at a very early age are inferior in fertility to those who refrain from marriage until the genital organs have attained complete maturity; and statistics show that those women who marry before attaining the age of twenty must wait longer for their first pregnancy than those who marry between the ages of twenty and twenty-four. At the higher age also, women bear parturition and its consequences more easily than those who marry very young. A similar influence in marriage to that resulting from undue juvenility is exercised by its opposite, marriage when a woman is already elderly; in this case fertility is limited, and health also is especially apt to suffer. When the indications of the climacteric are clearly apparent, marriage is contra-indicated, not only on account of the impossibility of fertilization, but also in respect of its general unsuitability in the closing stage of the sexual life.

Not only is the absolute age of the woman of importance in deciding on the advisability of marriage, but the relative ages of the proposed husband and wife must also be taken into account, first of all in respect of the wife's possible fertility, and secondly in respect of her general health. The most suitable arrangement is that in which there is no marked difference in age. The husband may be, and indeed in existing social circumstances almost necessarily is, somewhat older than his wife, as much perhaps as eight or ten years. But a very great disparity of age (in either direction) is a serious error. If a very young girl marries an elderly man, or a developed matron marries a young man, the true purpose of marriage is unfulfilled, the eternal laws of nature and all ethical principles are infringed. In the breeding of animals, the fundamental principle has long prevailed that the animals chosen for coupling should be well suited each to the other and should be in perfect physical condition; and breeders are also familiar both with the favorable influence of good nourishment and with the advantage of the opportune crossing of distinct varieties. The same principles are equally applicable to the human race, neglected as they commonly are in practice.

With regard to the marriage of near kin, we can only remark that the marriage of those closely related by blood should as far

as possible be avoided, and that such a marriage must be absolutely prohibited when in both families there is a history of tuberculosis, mental disorders, diabetes, and the like. When first cousins contemplate marriage, it is indispensable, not only that both individuals should be in perfect health, but also that on neither side there should be any serious family history of transmissible disease or transmissible morbid tendency; and, further, it is absolutely necessary that no such marriage of near kin should have taken place in the proximate ancestry of the cousins, *i. e.*, their cousinship must not be a double one, derived both from the paternal side and the maternal. It is indeed to be recommended, with a view to the production of a healthy and powerful posterity, that marriage should bring about a crossing of healthy individuals proceeding from different families, different places, and different constitutional types. An instance of the advantage to be found in this practice is pointed out by *Ribbing*, who shows that the most powerful aristocracy in Europe, that of England, by the gradual creation of new peers, on the one hand, and by the gradual decline of younger sons and their descendants into the middle class, on the other, has undergone a continual crossing with less exalted but originally sounder stocks; in this way its vigor and fertility have been maintained, in contrast to the nobility of many continental states, which has so largely perished, in consequence of its exclusiveness in the matter of marriage.

"In this connection," continues *Ribbing*, "we must bear in mind, that blood-relationship is not the only matter that has to be considered; in the interest alike of the family, and of society, it is necessary to demand that certain degrees of relationship by marriage alone, should fall within the 'prohibited degrees' of love and marriage. There are certain groups related by marriage and held together by the bond of affection, from which foster-parents and guardians may most suitably be selected to fulfil the duties as regards education and training of children who have been orphaned in early years. For such a purpose none seem better adapted than the brothers and sisters of the deceased parents; but the upbringing of the children can be confidently entrusted to the former only if the relationship between the older and the younger branches of the family is one regarded by law, and still more by morality and custom, as one precluding the possibility of the occurrence of sexual love and marriage."

Möbius, writing on "The Ennobling of the Human Race by Selection in Marriage," observes: "The most important aim of natural development is the perfection of humanity. The qualities of the coming generation depend for the most part upon the qualities of the parents. Marriage from affection ensures the fulfilment of

nature's aims with more security than marriage from reason; since what we have to think of is not the happiness of the married pair but the quality of their children. Of great importance, also, to the development of the human race are the conditions during the commencement of life, and the mode of education. The improvement of the race has not hitherto been the conscious aim of the generality of people. The law does not as yet, as it should, take into account the advantage of posterity. Capital punishment is fully justified and purposive. Criminals should not be allowed to marry. The perpetuation of disease by inheritance should be checked by the utmost powers of the state. Any one marrying while suffering from any venereal disease still in an infective condition should be punished. The marriage of persons suffering from tuberculosis should be prohibited. For the prevention of disease is more important than its cure. The most important factor in preventive medicine is an improvement in the conditions of life. The human ideal should be, goodness of heart in association with physical and mental health. Goodness, beauty, and strength should be simultaneously pursued. Since, however, man is made by birth far more than by education, selection in marriage is of fundamental importance. In the choice of a partner, attention is rightly paid to beauty, since beauty and health are fundamentally identical; moreover, a human being endowed with beauty is usually also more moral than one devoid of that attribute. Equality of birth is as a rule desirable in marriage; but not the family only is to be considered in determining the existence of such equality, individual characteristics must likewise be taken into account. Whether the crossing of races is desirable is not yet certainly determined."

From the hygienic standpoint it is necessary that in marriage also the frequency and the manner of sexual intercourse should be regulated.

Wise men and law-givers of all the nations of antiquity have insisted upon the necessity of certain intervals between the acts of intercourse. Thus, *Mahomet* prescribed 8 days, *Zoroaster* 9 days, *Solon* 10 days, *Socrates* also 10 days. Moses forbade intercourse during menstruation and for a week after the cessation of the flow. *Luther* prescribed intercourse "twice a week."

Birds and many mammals are competent to perform intercourse at exceedingly short intervals. A well-bred cock will repeat this act 50 times daily; a sparrow, 20 times in an hour; a bull, 3 to 4 times in an hour. In the human species, however, too rapid repetition of intercourse is deleterious not only to the male, but to the female also, though the latter certainly suffers in less degree. For in this act the female plays a more passive part, and for this reason

can repeat it with impunity more frequently than the male, who loses semen at each repetition. It is not possible, however, to lay down precise rules as to the permissible frequency of intercourse in either sex; the matter must depend upon physical needs. Moderate and regular indulgence in sexual intercourse is unquestionably advantageous to women both physically and mentally, regulating all the functions of the body, and tending to produce a contented and cheerful frame of mind.

During menstruation, a woman should refrain from intercourse. By the Mosaic law the death punishment was allotted both to the man and to the woman who indulged in coitus while the latter was menstruating. As a matter of fact, considerations alike of hygienic cleanliness and of sanitary precaution prohibit the performance of coitus during this period. Severe menorrhagia, perimetritic irritation, and parametritic inflammations, have been observed to follow such indiscretions. On the other hand, it is more than doubtful whether, in the event of pregnancy resulting from intercourse performed during menstruation (and conception is especially apt to occur at this time), the child is likely, as earlier authors maintained, to be unfavorably affected, and to suffer from cachexia, scrofula, or rickets.

After the act of intercourse, a woman should rest; and indeed sleep for some hours is especially to be recommended. A vaginal douche should not be administered until several hours have elapsed, otherwise there will be a risk of preventing fertilization of the ovum. The water employed for vaginal irrigation should never be quite cold; a temperature of 79°–82° F. (26°–28° C.) is best.

All measures for the purpose of artificially increasing sexual desire, such as alcoholic beverages (especially champagne), and certain drugs (especially cantharides), are even more harmful to women than they are to men. The woman who conceives while in a state of intoxication commits a great sin against the coming generation.⁴³ Just as harmful, however, are the anaphrodisiacs sometimes employed to diminish the intensity of sexual desire when this cannot be gratified. When affected with intense sexual excitement, a woman is much more unfavorably situated than a man, since man claims the right to indulge in sexual intercourse whenever he feels disposed,

⁴³ The statement is so often made that conception occurring when one or both parents are intoxicated is likely to be harmful to the offspring, that it seems expedient to point out that neither the author of this work, nor any other author known to me, has ever brought forward any rigorous scientific evidence in proof of the alleged fact. It is one of those crude generalizations whose superficial verisimilitude leads to their continued though unsupported reassertion. The fact that the notion of procreation by inebriated progenitors is repugnant to our æsthetic sensibilities has, of course, nothing whatever to do with the logical proof of the assertion that such an act is harmful to the fruit of conception.—TR.

and has, moreover, ample opportunity for sexual gratification. A woman, however, properly endowed with self-respect, will understand how to bridle her senses. Bodily exercise, moderate, unstimulating diet, intellectual occupation with serious matters, the avoidance of equivocal literature and of sensual dramatic representations, cold bathing, and the use of a hard mattress and light bed-clothing—these means will coöperate powerfully toward the prevention of excessive sexual desire. *Horace* already remarked: “*Otia si tolles, periere Cupidinis arcus.*”

The wife should know how to bridle, not her own desires only, but also those of her husband. She must not demand too much during the intoxication of youthful vigor; she must prevent the complete combustion of the flames of masculine passion, and must keep sparks glowing in the ashes. Economy during the sexual prime preserves sexual power, enables a man to continue intercourse to a ripe age, and avoids premature exhaustion and satiety. When the husband is drawing near the end of his sixth decade, the wife must accustom herself to see in him rather the father of her children than her own husband, and must reduce her sexual demands to that measure which will not be injurious to his health. *Demosthenes*, writing of the sexual life of the Athenians of his time, said: “In order to obtain legitimate offspring and to provide a faithful guardian of our household, we marry a wife; for our service and for the performance of daily household duties, we keep concubines; for the joys of love, we seek the *hetairai*.” The task is extremely difficult, but a clever and virtuous modern wife must endeavor to combine in her single personality the sensual attractiveness of an *Aspasia*, the chastity of a *Lucrece*, and the intellectual greatness of a *Cornelia*; she must bear in mind the epigram of *Bacon*, “A wife must be a young man’s mistress, a middle-aged man’s companion, an old man’s nurse.”

In the act of intercourse the woman must always play the more passive part; she must be desired, rather than desire. Woman’s modesty increases man’s desire. By this coquetry, permissible because natural, the woman can bind the man to herself, and can give the lie to the assertion that marriage is the grave of love. Partial concealment of her desire on the part of the woman is more stimulating to the man than an open manifestation of the sexual impulse; and a certain amount of modest reluctance is more alluring to him than a plain invitation. *Schiller* makes *Fiesco* say to the Countess *Julia*, as he covers up her bosom, “The senses must be blind letter-carriers only, and must not be aware of that which nature and the imagination communicate each to the other. The best of news is stale as soon as it has become the talk of the town.”

For this reason, also, it is more suitable that intercourse should take place, not by day, consequent on the brutal prompting of vision, but by night only, beneath the protecting veil of darkness. A night's rest, moreover, will serve to restore the exhausted nerves, and to replace the expended secretions. Less advisable is coitus in the morning, on awaking from sleep, since the labors of the day must immediately thereafter be undertaken. Partially impotent men only, who wake up with an erected penis, endeavour to avail themselves without delay of this favorable opportunity, bearing in mind the French proverb, "On aime quand on peut, et non pas quand on veut."

The French custom, in accordance with which the married pair sleep together in a double-bed is undesirable on several hygienic grounds, and, in the first place, for the reason that this continuous nocturnal proximity is likely to give rise to the habit of indulging in excessively frequent acts of intercourse. The best and most affectionate of men has neither disposition nor capacity to play the part of Romeo every night, and thus the value and enjoyment of marital duties becomes lessened. The fulfilment of his desires should not be rendered quite so easy to the husband; he should always appear the lover, one who seeks a woman's favours because he longs for her; he should not be the master, exacting an unquestioned right. For this reason, separate beds are advisable for the married pair, and, when possible, even separate bedrooms.

Among the ancients, *Lycurgus*, the Spartan law-giver, regarded maternity as woman's principal attribute, and considered the sexual impulse to be the means merely by which healthy citizens were provided for the state. In accordance with this view, the sanctity of marriage was violated, and every powerful, handsome, and valiant Spartan had the right to request the privilege of intercourse with the wife of another, in order to enrich that other's family with his seed. Elderly, impotent men conducted well-formed young men into the arms of their own wives. The girls, like the young men, went through a course of gymnastic exercises, in order to harden their bodies, and to fit them for the bearing of strong and healthy children. No man might marry before attaining the age of thirty, no woman before attaining the age of twenty. Girls ripe for marriage were assembled in a dark place, and there the young men chose their brides, as chance might direct. The young men were allowed to visit their wives by night only, and secretly, in order that the vigor of the sexual impulse might be increased and maintained.

Among the Spartans, it happened quite frequently, that a man whose wife had remained childless, and who believed himself to be

at fault in the matter, would beg one of his fellow-countrymen, or even a foreigner, to come to his assistance. It was enacted by one of Solon's laws, to prevent a man from neglecting his marital duties, that he should have intercourse with his wife not less than three times monthly. According to another of Solon's laws, an Athenian heiress might call upon her nearest relative for the gratification of her sexual desires.

The bluntest contrast to this Spartan simplicity is furnished by the unbridled lasciviousness that prevailed in Rome under the Cæsars, when women's sole desire was sexual enjoyment, while maternity was a state to be avoided. To such an extreme was this carried, that the Roman ladies of that day preferred to marry eunuchs, and further, as *Pliny* reports, hermaphrodites were in great request. *Juvenal* writes: "There are women who prize the infertile embraces of base eunuchs; thus they are able to dispense with the use of abortifacients."

The hygiene of the nuptial night deserves from the physician more attention than it has hitherto generally received. He should warn and enlighten the young husband, in order that the brutality with which the act of defloration is apt to be performed may be lessened, and further in order that mistakes in this connection, resulting from ignorance and likely to have serious consequences, may be avoided. It is well known that lacerations of the hymen and its environment, and even serious injuries of the genital organs, may result from maladroit attempts at penetration. The physician will admonish the husband in the words of *Michelet*: "Bear in mind in this hour that thou art an enemy, a tender, considerate, and gentle enemy!"

The young woman entering upon marriage should receive instruction from her mother regarding all the sexual processes of copulation, instruction at once earnest and complete. By such enlightenment, the young bride will be spared much suffering, and a sudden disillusionment which might seriously affect the whole of her future life will be avoided; complete ignorance, on the other hand may lead, not merely to needless mental and physical suffering, but to the most tragic consequences on the bridal night. In one case known to me, the young wife, who before marriage was utterly ignorant of the nature of physical love, was so completely overwhelmed in her ideals by the somewhat energetic procedure of the bridegroom as soon as he found himself alone with his wife, that she fled from her new home then and there in the night, and by no persuasions could be induced to return.

In that decisive moment in which the maiden loses her virginity, she must find in her husband, not the brutal man who forcibly takes

possession of her body, but the chosen man of all, to whom her love can refuse nothing.

“Delicate foresight and restraint,” writes *Ribbing*, “are needful above all at the commencement of married life. The young wife, coming to the bridal bed a pure virgin, is not, like her husband, fully prepared for what is to take place. In all cases she is somewhat fearful of the new experience. The first act of intercourse involves for her a certain amount of pain, and this pain is not solely physical. * * * Moreover, we must remember that the entire change in her mode of life makes a deep impression upon a woman’s mind; time and quiet are needed before she can find herself at home in the novel surroundings, before she can adapt to the changed circumstances her moral and religious convictions, and before she can ‘think true love acted simple modesty’ (*Romeo and Juliet*, III, 2.16). Impatient husbands, through want of knowledge and lack of consideration during the honeymoon, have often ruined the happiness of subsequent married life.”

It happens often, unfortunately, that the wife has reason to complain of the reckless manner in which her husband has used, or misused, his sexual powers. Frequently enough, on the bridal night, the man proceeds with such violence in his assault on the virgin reproductive organs of his newly-wedded wife, that we must actually speak of him as ravishing an ignorant and timid girl. Later, when the stimulus of novelty has passed away, the husband often performs intercourse in a manner more calculated to awaken his wife’s sexual desires, but in seeking his own lordly gratification and obtaining it he is still apt to leave out of the reckoning the need for effecting coitus in such a way as will give complete satisfaction also to his wife.

The wedding journey likewise deserves consideration from the hygienic standpoint. Much is to be said in favor of such a journey, inasmuch as it endows the necessarily somewhat brutal first act of intercourse with an aspect of romance. The removal to a foreign country, to a strange environment, will spare the chaste maiden much shame and vexation. On the journey, moreover, the young couple are much in each other’s company, and the process of mutual adaptation is agreeably favored. And yet this modern custom of making a wedding journey entails certain serious disadvantages. The young woman leaves her home and her nearest relatives, and is in a moment involved in the excitement of travel, an excitement liable to increase to the degree of morbid anxiety. The fatigues of railway-travel, of wandering about strange towns, of visits to museums and picture-galleries, are apt to cause general loss of nervous tone, and also local hyperæmia of the genital organs. In

addition, false modesty and the prescribed arrangements for the journey may lead the onset of menstruation to be ignored and the customary rest at this period to be dispensed with. Still more, the possibility of the occurrence of conception and of the commencement of pregnancy is usually left altogether out of the account. Many an attack of menorrhagia, of perimetritis, and of endometritis, many a miscarriage, and many instances of protracted sterility, are dependent upon the hygienic mistakes of the wedding journey, and less, indeed, upon the abuses arising out of the intoxication of passion, than upon the fatigues of excessive travel both by day and by night. The bride who on her wedding-day was young, healthy, and full of vitality, not infrequently returns from the wedding journey a sickly and debilitated woman.

With regard to wedding journeys in relation to the causation of chronic metritis, *Scanzoni* has expressed an authoritative opinion. "After many weeks of unsatisfied sexual desire, the young married pair, now freed from all restraint, give themselves up to the joys of love; the intense sexual excitement causes great stimulation and hyperæmia of the female sexual organs; in addition, the noxious influences of travel make themselves felt, and also hygienic indiscretions are perpetrated, dependent upon the young wife's modesty; it is, therefore, by no means to be wondered at that, having left home a perfectly healthy woman, she returns from her wedding journey with the germs of an illness from which she never fully recovers, and which is the source of unending suffering, and more particularly of a sterile marriage."

Sexual hygiene demands a certain moderation in the enjoyment of physical love, and also a certain constancy, such as may be expected in a happy marriage.

It is not possible to lay down a general rule with regard to the frequency of sexual intercourse, notwithstanding the earnestness with which religious zealots, physicians, and moral teachers have in all ages endeavored to determine how often it was proper for a man to cohabit with his wife. The rules that have been prescribed by the various authorities had in view, for the most part, the protection of the wife from excessive demands on the part of her husband; sometimes, however, by the establishment of a minimum period, a certain amount of sexual gratification was secured to the wife; finally, also, the generation of a healthy posterity had to be taken into consideration. *Ribbing*, however, justly observes: "Sexual intercourse results from a natural impulse, and he whose senses are unimpaired, and who has learned, at the same time, amid the tumult of his sensations, to preserve proper consideration for his wife — such a man runs little danger of making any mistake. In

opposition to the opinion of many, I regard it as entirely right and reasonable that husband and wife should have intercourse whenever physically and mentally impelled to that act. Nor do I see any reason why, during the first period in which they are able to enjoy without intermission the pleasures of sexual intercourse, they should, in accordance with any theory whatever, impose on themselves further restraints than those demanded by care for their physical and mental health. The touchstone of marital hygiene is this, that on the day following intercourse both husband and wife should feel perfectly fresh, vigorous, and lively, alike in body and mind — even more so, perhaps, than on other days. In the absence of such feelings, we may feel assured of the occurrence of sexual excesses." The same author quotes a saying of *Pomeroi's*: "We may quaff the nectar as freely as we will — nature herself mixes the draught and holds the goblet to our lips; if, however, we drink too much, she first dilutes the draught with water, later adds gall, and ultimately perhaps deadly poison."

The occupation, trade, or profession, and the nutritive condition and physical constitution of the married pair, have an important bearing on the frequency with which, without detriment to health, cohabitation is permissible. The rules of the Hebrew Talmud already take these circumstances into account, ordering as they do that young and powerful men not engaged in any regular occupation shall have intercourse with their wives daily; manual labourers, on the other hand, once a week only; whilst brain-workers, finally, or those whose work is extremely arduous, should allow an interval of one or more months to elapse between the acts of intercourse. *Acton* also prescribes that in the case of brain-workers and of those manual workers whose labours are exhausting, intercourse must not occur more frequently than once every week or ten days.

The married couple should understand how to impose on themselves a certain restraint in the matter of marital intercourse, without, however, going so far as on altogether trifling grounds to refuse the husband access to his wife. In this respect also, the opinions that have recently come to prevail concerning the rights of women have had an influence. *W. Acton* relates a case that came under his observation in which the wife refused to allow her husband any voice in determining when and how often intercourse should take place; the wife, she maintained without hesitation, since she had to bear the consequences of intercourse, was fully justified, whenever she thought fit, in refusing her husband's embraces.

The dangers to the sexual life of woman which are involved by the modern woman's rights agitation are seen already in the changes which the emancipation of women in North America has produced

in the functions of woman as wife and mother. In that part of the world, everything possible has been done "to transform" (to quote the words of a brilliant journalist) "the doll into an independent existence, to enable the helpless woman to earn her own subsistence, and the result of these endeavors has been most striking. The American woman has obtained the right to enter every profession and to follow every kind of occupation which have hitherto been reserved for men; she is physician, lawyer, merchant, professor; her boudoir has become an office, often connected with the stock exchange by a private wire. Legally, also, she now possesses the same rights as man; in many States she has both the suffrage and the right of entering the house of representatives; she has fully emancipated herself from her former condition of tutelage, and in her shrillest tones can cry to heaven 'I am free, I am independent, I am emancipated, I am myself!' And observe, as the result of all these attempts at the conversion of woman into man, that in the matter of marriage also she acts as if she were no longer woman. The American woman no longer marries; perhaps, indeed, because she no longer has the capacity. So long and so eagerly has she given herself up to masculine occupations, that her inward feminine nature has also perhaps undergone transformation, so that she has become affected with a kind of neutral lack of desire. Unquestionably, the desire for marriage on the part of this modern 'emancipated' woman has vanished in the most alarming manner, there is a notable fall in the birth-rate, and the indigenous (white) population actually threatens to disappear."

The wife acts wisely, not on hygienic grounds alone, in not always acceding at once and unconditionally to her husband's demand for the repetition of intercourse. Her modest reluctance enhances her desirability in the eyes of her amorous husband. Thus, *Shakespeare* makes Posthumus exclaim (*Cymbeline*, Act II., Sc. 5, l. 9):

"Me of my lawful pleasure she restrained
And prey'd me oft forbearance; did it with
A pudency so rosy the sweet view on't
Might well have warmed Old Saturn."

Especially justified is such refusal when coitus has been already once or twice performed, or when the consumption of alcoholic beverages has made the husband unduly lustful. On the other hand, the refusal of intercourse when demanded by the husband should never depend upon baseless feminine caprice, or upon the now so frequently asserted "rights of women."

Experience has long ago established as a fact that unduly frequent satisfaction of the sexual impulse entails serious consequences to the health of the individual. And in the case of the wife these

consequences may be especially disastrous when intercourse is indulged in recklessly during menstruation, during all stages of pregnancy, and even during the puerperium. "Incontinence during menstruation leads to serious circulatory disturbances and to the consequences of these disturbances; during pregnancy it is likely to give rise to miscarriage; during the puerperium, to congestions and inflammations. Should conception occur as a result of intercourse during the lying-in period (and this may happen very shortly after childbirth), abortion, and even more serious consequences, are likely to ensue. By intercourse during lactation, the premature recurrence of the menstrual flow is induced, and the gradual reversion of the reproductive apparatus to the condition in which it was before pregnancy (the process of involution) is hindered; moreover, the secretion of milk is diminished or even entirely suppressed." In these terms *Hegar* depicts the consequences of premature resumption of marital intercourse, taking perhaps a somewhat extreme view of the matter.

Nevertheless, this author is undoubtedly right in declaring that one of the principal disadvantages to a woman of excessively frequent sexual intercourse is that pregnancy occurs too often. It is astonishing to observe the number of full-term deliveries and miscarriages that a woman will experience within a comparatively short period of time, as is seen too frequently among the labouring classes and more especially among factory workers. "If we assume the ordinary mortality of childbed to be 6 per mille, a woman who in the course of 15 years undergoes labour (at full term or prematurely) 16 times, runs a risk of death to be expressed by the ratio of $6 \times 16 = 96$ per mille; that is to say, on the average, of 1,000 women who become pregnant as often as this, nearly 1 in 10 will die in childbed."

Young men who have previously suffered from gonorrhœa and who wish to marry, must, unless they wish to cause unspeakable misery, undergo an exact and thorough examination; not only must the physician inquire as to the presence of certain symptoms, such as smarting during micturition, adhesion of the lips of the urethral meatus, "clap-threads" in the urine, etc., but during a considerable period of time repeated microscopical examinations of the urine must be undertaken, and the filaments, if present, must be examined for gonococci. The physician will also have to determine whether any vestiges remain of epididymitis, and whether the quality of the semen has been impaired by the attack of gonorrhœa. Unfortunately, it is not yet within our power absolutely to forbid marriage to a man exhibiting all the symptoms of chronic gonorrhœa; but it is the duty of the physician to explain to such a man the scientific

views regarding this matter that now prevail, in order to furnish him with the grounds for a decision.

It is not possible, when discussing the hygiene of married life, to preserve silence respecting the extremely pressing question of the use of measures for the prevention of conception, for in recent years their use has become extraordinarily general, chiefly, indeed, in the upper and middle classes of society, but to some extent also among the working-class population. Although we devote a special chapter to this topic, we must here express the opinion that, except in certain instances in which their employment can be justified on carefully weighed and well-established medical grounds, the use of any mechanical or chemical means for the prevention of conception must be discountenanced as injurious to health. The wife who wishes to preserve her psychical purity and moral chastity, which is not only possible in marriage but also greatly to be desired, must not concern herself much with the technique of the sexual life, but must give herself up to sexual enjoyment only as the result of a delicate and immediate bodily and mental desire. Not only for reasons of national economy regarding the means of providing for the family, but also for well-grounded personal reasons regarding the wife's health, must the latter be spared an unduly rapid succession of pregnancies and confinements. And this should be effected by a certain degree of continence and by the observation of extensive periods of sexual quiescence.

To preserve a woman's health during the acme of her sexual activity, a careful general hygiene is an important requisite. The dwelling should be dry and roomy; above all the bedroom should not be too small, neither damp nor dark, and it should be well ventilated. The wife's occupations should be so arranged as to afford a suitable alternation of activity and repose, and there should be as little night work as possible. Certain occupations are especially potent in the causation of the diseases peculiar to women, principally, for the reason that they do not permit of the requisite repose during menstruation. Thus, washerwomen, vocalists, and sewing-machine operatives, suffer with especial frequency from diseases of the genital organs.

Great care in the cleansing of the genital organs is indispensable in the case of women; the vulva and its environment should be frequently and carefully washed; and an occasional vaginal injection is advantageous. As regards the last-named measure, however, we must point out that it is possible to err by excess as well as by defect, and that a daily vaginal douche can by no means be regarded as a necessary part of the hygiene of the reproductive organs. For recent researches have shown, on the one hand, that the vagina con-

stitutes a natural mechanism for the destruction of pathogenic organisms, and on the other hand, that complete disinfection of the vagina is extremely difficult to effect. Inflammations of the vulva, which are somewhat frequent in consequence of excessive perspiration and undue discharge from the genital canal, demand careful cleansing with soap and water and the use of a soft brush. The addition to the water of lysol (in the proportion of $\frac{1}{4}$ to $\frac{1}{2}$ per cent.) is advantageous. A general bath or a local sitz bath, the water being moderately warm (95° – 99° F.; 35° – 37° C.), may be recommended on grounds of beauty as well as of health, and should be taken at least once a week.

The regular use of lukewarm sitz baths is a most valuable hygienic measure for the prevention of various general or local disturbances consequent upon increased flow of blood to the genital organs. These local baths are best taken at a temperature of 95° F. (35° C.), and should last twenty minutes; they should be taken just before going to bed, and while sitting in the hip bath the skin of the abdomen and of the lower part of the back should be rubbed with the hand encased in a friction-glove. The bather on leaving the bath should get straight into bed, and should dry herself beneath the bed-clothes, rubbing the skin till it glows. Such sitz baths serve also to keep the external genitals clean, and to guard against infection. For vaginal douching, water sterilized by boiling should be employed, and where any catarrh of the vaginal mucous membrane is present, some alum, permanganate of potassium, or boric acid may be added with advantage; the pressure of water, when a vaginal douche is given, should never be high, the reservoir of the irrigator being raised not more than twenty inches above the outlet of the nozzle; as a rule the water should be lukewarm; the patient should be in the recumbent posture. The reservoir of the irrigator and the intravaginal nozzle are most suitably made of glass, to insure cleanliness; the nozzle should not be thrust too far in, two inches being quite sufficient. After the use of the douche, the woman should remain ten or fifteen minutes in the recumbent posture.

In addition to the hygienic employment of such full baths and local baths, a number of mineral baths have important therapeutic applications in cases of disease of the female genital organs, the traditional value of such baths having been scientifically endorsed by the modern science of balneo-therapeutics. By means of suitably selected mineral water baths, a powerful derivative stimulus may be given to the skin, and the affected reproductive organs may thus be beneficially influenced. Further, in acute inflammatory conditions or hyperæmia of the uterus or its annexa, these baths have an antiphlogistic influence; on the other hand, when intrapelvic exuda-

tions have formed, the baths promote the absorption of these inflammatory products; again, in congestive states of the female genital organs, with relaxation, thickening, and hypersecretion of the genital mucous membrane, the baths have an astringent and tonic influence on the tissues; finally, they have a favorable effect on the innervation and nutrition, not only of the reproductive apparatus, but of the entire organism. It is easy to understand why women during the menacme are frequent visitors to spas.

At this period of life, and especially in women who lead *luxurious* "society" lives, the thoughts tend strongly in the sexual direction; to avoid this, and to prevent the ever more and more frequent breaches of marital fidelity, the best means are the practice of vigorous bodily exercises, and active employment, either in household affairs or in intellectual occupations. Cold sponging of the body or cold full baths will also be found an excellent measure for the prevention of sexual excess. In such cases also the diet should be limited, strong and stimulating food should be avoided, but little butcher's meat should be taken, whilst green vegetables and raw and cooked fruits should be liberally consumed; at the same time, all alcoholic beverages must be rigidly prohibited. Moreover, care must be taken that during the night there should be no undue physical stimulation in consequence of excessively warm and soft bedding; hair mattresses are to be preferred to feather beds, with light down quilts for a covering. Finally, no stimulation of an erotic character should be offered to the imagination, and for this reason equivocal literature and lascivious dramatic representations must be avoided. By a sufficiency of occupation, regular, interesting, and demanding a considerable expenditure of physical energy, a woman may be enabled to a great extent to escape the inconvenience and distress attendant on entire or partial lack of gratification of the sexual impulse.

It cannot be disputed that a certain and moderate amount of sexual gratification is requisite for the perfect maintenance of physical health in woman, and that the absence of this gratification, or the gratification of the impulse in an abnormal or incomplete manner, entails disturbance of alike the mental and the physical equilibrium; but, on the other hand, the deleterious consequences of sexual abstinence have been greatly exaggerated by many writers — both by physicians and social economists. Owing to the fact that to the cultivated woman sexual gratification is possible only in the married state, whilst social conditions render marriage impossible to many women greatly in need of such gratification; in consequence, also, of the modern and ever more widely diffused practice by husbands of coitus interruptus altogether regardless of the woman's need for complete sexual gratification — there arise in women nu-

merous local disorders and nervous disturbances, hysteria and even insanity being results by no means infrequent. The significance of ungratified sexual impulse in the pathogenesis of nervous disorders has been established by *von Krafft-Ebing*, who points out that in unmarried women insanity most frequently occurs between the ages of twenty-five and thirty-five years, during the decade, that is to say, in which youthful bloom and the hopes of marriage simultaneously disappear; whereas in the male sex the greatest incidence of insanity is between the ages of thirty-five and fifty years, the period of life in which the struggle for existence is fiercest.

Hegar, on the other hand, is a firm opponent of the view that the favourable influence of marriage is overrated. According to this author, the favourable effect of marriage in respect of mental disorders is to be found, not in the gratification of the sexual impulse, but in the ethical factors of marriage. Statistics show that even in the favourable circumstances of marriage, sexual gratification has in women an unfavourable influence, inasmuch as the proportion of sufferers from mental disorders is higher among married women than it is among married men. A study of the mental disorders which in women are especially associated with the process of reproduction (puerperal mania) confirms this impression. *Hegar* insists that he has never seen nymphomania arise in women in consequence of forcible repression of the sexual impulse; but that he has not infrequently seen this disorder result from unnatural excesses or from long-continued sexual irritation, especially in hereditarily predisposed persons. Such unnatural stimulation of the female is not infrequently practiced by the male—by the lover and even by the husband—it may be because he himself derives pleasure from such perverted practices, and wishes to obtain sexual gratification without the risk of impregnation, or because he is himself incompetent for normal complete intercourse. *Hegar* is further of opinion that in the causation of hysteria and also in that of chlorosis the repression of the sexual impulse plays a quite subordinate rôle. And he regards as pure fable the belief that continence in women is liable to lead to the formation of mammary, uterine, or ovarian tumors. He would more readily incline to the contrary opinion; the reproductive process being in this respect distinctly disadvantageous to the female sex. The unfavorable influence of the reproductive process is shown most clearly in the case of carcinoma of the uterus; the majority of the patients suffering from this disease are either married or widowed, and many of them have given birth to a large number of children. "Gratification of the sexual impulse, and more particularly the reproductive process, give rise in women to the

formation and growth of tumors, cause numerous mechanical disturbances, and open the way to infection with various pathogenic organisms."

Hegar considers that there is hygienic justification for the limitation of the number of children to which a woman gives birth. The most suitable age for motherhood lies in his opinion between the ages of twenty and forty years. Childbirth in women younger or older than this entails too much danger both to mother and child. At least two and a half years ought to elapse between two successive births; and these figures give us eight as the maximum family. If we assume that the duration of pregnancy is nine months, and that of lactation nine to twelve months (or in cases in which the mother does not nurse her own infant, that a like period must be devoted to the careful supervision of the wet-nurse or of the methods of artificial feeding), we cannot consider it unreasonable to devote a further period of from six to nine months to the complete re-establishment of the woman's health. "Moreover, woman does not exist solely for the purpose of subserving during two decades of her life the processes of reproduction. And to permit the maximum number of children to be as great as eight, we must presuppose that the woman is in perfect health, and that she lives in a perfectly healthy environment. Any illness or infirmity which renders the duties of housekeeping and the rearing of the existing family unduly difficult, indicates the need for a further limitation of childbearing. And if the reproductive function is to be rationally controlled, we must above all attend to the age and the health of the parents. Occupation, habitation, and general environment have also to be considered. The correct ideal is indeed not difficult to discover."

Hegar concludes that strict moderation and even absolute continence in sexual matters are often, and for long periods of time, a pressing duty. "The numerous and various disasters which are brought upon the world by unbridled and unregulated sexual passion can be prevented only by enlightenment, moderation, and continence. If marriage were postponed until the attainment of complete physical maturity, in women till the age of 20, in men till the age of 25, while at the same time procreation were no longer undertaken by women above the age of 40 or by men above the age of 45 to 50 years; if, again, between successive pregnancies a sufficient pause for the woman's recuperation were insisted upon, and intercurrent illnesses and states of debility were taken into account; and if, finally, sickly individuals, those hereditarily predisposed to disease, and those in any way below par either mentally or physically, were more than heretofore prevented from marrying; then the increase of population, which in Germany is unquestionably

too rapid, would to some extent be checked. Thoroughgoing regulation of the reproductive process will not, however, be thus attained without the adoption of a method of selection too rigorous for present-day notions; and for a further advance we must in the meantime depend upon moderation and continence." As regards the modern demand of the "right to love," the same experienced gynecologist writes: "Whoever preaches to mankind the doctrine that 'a man sins against his own personality if he neglects to exercise every limb he possesses, and if he denies himself the gratification of every natural impulse,' or the doctrine that 'it is the duty of every human being to gratify all his natural impulses, since these are most intimately inter-connected with his personality — are indeed his personality itself,' such a preacher does harm to his kind. Such rights and such duties are chimerical for this reason if for no other, because two persons are necessary in the case of sexual gratification, and sometimes — though not as often as might be wished — Hans fails to find his Grete, without any consequent loss to society at large."

An especially important chapter in the history of woman at this period of life relates to the dietetics of pregnancy and parturition, and to the regulations to be observed for the maintenance of health at this time and in connection with the processes of pregnancy, parturition, puerperal involution of the uterus, and lactation. This subject cannot now however be considered at length, and for our present purposes it is sufficient to point out how important it is alike for mother and child, alike for family and society, that the ever more and more widely and generally diffused practice of the artificial feeding of infants should be abandoned, and that there should be a return to the natural method according to which each mother nurses her own infant. The prevailing custom costs every year thousands of mothers their health, and thousands of children their lives.

COPULATION AND CONCEPTION.

Copulation.

The reproduction of the species is effected by means of an act of copulation on the part of a male and a female individual, both of whom must have attained complete sexual development. In all the sequence of reproductive processes it is copulation alone that is a voluntary act, all the other processes being independent of the will and even of consciousness.

A characteristic difference between man and the lower animals lies in the fact that in the human species sexual pleasure and the act of copulation may occur at any season of the year; and a

further characteristic difference may perhaps be found in the fact that in the great majority of individuals of the human species the psychical process of "love" plays a determinative part. *Voltaire* pointed out that to man alone among animals are known the embrace and the joy of the kiss.

The significance of the kiss is depicted by *Grillparzer* in the following verses:

Auf die Hände küsst die Achtung,
Auf die Wangen Wohlgefallen,
Seelige Liebe auf den Mund.
Auf den Nacken das Verlangen;
Überall sonsthin Raserei.*

In this act of conjugation between two individuals of the same species, differentiated each from the other by the characteristics of sex, the active, provocative rôle is allotted to the male, the passive, receptive rôle, to the female. The modest and coy reluctance characteristic alike of the maiden and of the wife, promote an increase of sexual excitement in the opposite sex, and this not only in a man of purely sensual character, whose vanity is stimulated by his being the chosen one among many — a circumstance which, in view of the great dependence of the sexual act upon psychical processes and imaginative influences, is by no means devoid of importance. The woman's coy reluctance must be overcome by means of a tender strategy before she is willing to grant the final possession of her body; and the act of copulation forms at the same time the conclusion of the physical and mental yearnings of the lover, and the commencement of the new-coming being. There is thus a physiological reason for the advice given by the celebrated surgeon, *Ambroise Paré*, that a man, before completing coitus, should employ some of the delicate and sensually stimulating manipulations of the earlier stages of courtship, for, he writes, "aucunes femmes ne sont pas si promptes à ce jeu que les hommes."

The potency for intercourse of the sexually mature man, his capacity for the introduction of the erect penis during the act of copulation, is dependent on the fact that sexual excitement gives rise to a sufficient stimulus which, acting on the erection centre (and presuming that the centre and its afferent and efferent tracts are normal), leads to an increased flow of arterial blood to the penis

* Respect kisses the hand,
Affection kisses the cheek,
Spiritual love kisses the mouth.
Desire the neck;
Amatory frenzy kisses the whole body.

and a diminished outflow through the veins of that organ, and consequently to its erection. The cerebrum is the organ in which the sensation of *libido sexualis*, of sexual excitement, has its seat; with this higher centre is connected by means of intercentral nerve tracts a lower, mechanical, reflex centre, situated in the lumbar enlargement of the spinal cord, and presiding over the performance of the act of copulation; it is moreover probable that nerve fibres proceed from the spinal cord direct to the blood vessels of the erectile tissue, by means of which the calibre of these vessels can be lessened or their extensibility diminished. The relation of the erector nerves (*nervi erigentes*) to the penis is by many physiologists compared to the relation of the vagus nerve to the heart. In the quiescent state the small arteries of the penis and perhaps also the cavernous spaces of that organ are in a state of mean contraction, so that they offer a considerable resistance to the passage of the blood current. When now the *nervi erigentes* are excited to activity, the hitherto tonically contracted vessels of the penis undergo, according to the school of physiologists just mentioned, relaxation, so that they dilate under the pressure of the blood within their walls, and, the previous resistance to the flow being now removed, the blood pours freely into the cavernous spaces of the penis, and distends these to the uttermost. In this manner erection is effected, rendering possible the insertion of the penis into the genital passage of the female; with the culmination of the sexual act, the semen is ejaculated, the muscles of the prostate and the membranous portion of the urethra together with the ischiocavernosus and bulbocavernosus muscles, all acting strongly and simultaneously.

By the contraction of the muscular apparatus just described, the penis is constricted in the neighborhood of the pubic symphysis, and this further hinders the outflow of the blood from the corpora cavernosa, increasing the intensity of the state of erection of the penis. Should the relaxation of the corpora cavernosa, dependent upon the stimulation of the *nervi erigentes*, be incomplete, it is not possible for sufficient blood to pass into the cavernous spaces to exercise considerable pressure upon the efferent veins, and thus complete erection fails to occur. If, again, the contraction of the muscular apparatus at the root of the penis is insufficiently vigorous, complete erection likewise fails to occur; the organ becomes semi-erect only, or erect for a period too short to permit of the completion of intercourse.

Since, physiologically speaking, conception is the purpose with which copulation is effected, the ejaculation of the semen must be regarded as the principal object of that act; now in normal conditions, ejaculation takes place only when the penis is fully erect.

Associated with the erection of the corpora cavernosa is a swelling of the caput gallinaginis, whereby the orifices of the ejaculatory ducts are directed forwards toward the membranous portion of the urethra, and at the same time the backward passage to the bladder is cut off. By this mechanism, the urethra, which usually serves as the canal for the outflow of urine, is made for the time being solely subservient to the purposes of the sexual act. That the outlet from the bladder is obstructed by the swollen caput gallinaginis when the penis is erect, is shown by the familiar fact that a man whose penis is erect cannot pass water, although the way is freely open for the ejaculation of the semen.

Before ejaculation begins, the urethral glands already begin to secrete; and when erection is powerful and prolonged, this secretion often makes its appearance at the urethral orifice in the form of drops of a clear somewhat tenacious fluid. *Utzmann* considers that the function of this secretion is probably to moisten the walls of the urethra, over which the acid urinary secretion is continually flowing, with a protective alkaline fluid, and thus to prepare the canal for the passage of the semen. An analogy may be found in the secretion of the cervical glands of the uterus in the female, for this secretion has been found to enhance the activity of the movements of the spermatozoa. If now during copulation the moment of ejaculation begins, the male experiences at the same time a sense of voluptuous pleasure and a feeling of muscular spasm in the perineal region, and this indicates the commencing evacuation of the contents of the seminal vesicles through the ejaculatory ducts. Simultaneously, the secretion of the prostate is poured into the urethra. The semen now gradually passes out through the narrow ejaculatory ducts, and, since in consequence of the swelling of the caput gallinaginis, it cannot pass backwards towards the bladder, it runs forwards, and accumulates in the bulb of the urethra, the physiological excavation of that tube. As soon as a considerable quantity of the semen has collected in this situation, so that the bulb of the urethra becomes distended, reflex contractions of the bulbocavernosus muscles ensue, by means of which the seminal fluid is forced out of the urethral orifice. In cases in which this muscular apparatus does not function properly, as in the paralytic form of impotence, the semen during ejaculation is not ejected in a forcible jet, but rather flows slowly, as from a lax tube partially filled with fluid, from the urethral orifice.

We are indebted to *Roubaud* for a classical description of the phenomena of copulation, and this description is here appended. It runs as follows: "As soon as the penis enters the vaginal vestibule, it first of all pushes against the glans clitoridis, which yields

and bends before it. After this preliminary stimulation of the two chief centres of sexual sensibility, the glans penis glides over the inner surfaces of the two vaginal bulbs; the collum and the body of the penis are then grasped between the projecting surfaces of the vaginal bulbs, but the glans penis itself, which has passed further onward, is now in contact with the fine and delicate surface of the vaginal mucous membrane, which membrane itself, owing to the presence of erectile tissue between its layers, is now in an elastic, resilient condition. This elasticity, which enables the vagina to adapt itself to the size of the penis, increases at once the turgescence and the sensibility of the clitoris, inasmuch as the blood that is driven out of the vessels of the vaginal wall passes thence to those of the vaginal bulbs and the clitoris. On the other hand, the turgescence and the sensitiveness of the glans penis itself are heightened by compression of that organ, in consequence of the ever increasing fulness of the vessels of the vaginal mucous membrane and the two vaginal bulbs.

"At the same time the clitoris is pressed downward by the anterior portion of the compressor muscle, so that it is brought into contact with the dorsal surface of the glans and of the body of the penis; in this way a reciprocal friction between these two organs takes place, repeated at each copulatory movement made by the two parties to the action, until at length the voluptuous sensation rises to its highest intensity and culminates in the sexual orgasm, marked in the male by the ejaculation of the seminal fluid, and in the female by the aspiration of that fluid into the gaping external orifice of the cervical canal; so true, indeed, is this, that it is a difficult matter to give a picture at once accurate and complete of the phenomena attending the normal act of copulation. Whilst in one individual the sense of sexual pleasure amounts to no more than a barely perceptible titillation, in another that sense reaches the acme of both mental and physical exaltation.

"Between these two extremes we meet with innumerable states of transition. In cases of intense exaltation, various pathological symptoms make themselves manifest, such as quickening of the general circulation, and violent pulsation of the arteries; the venous blood, being retained in the larger vessels by general muscular contractions, leads to an increased warmth of the body; and further, this venous stagnation, which is still more marked in the brain in consequence of the contraction of the cervical muscles and the backward flexion of the neck, may cause cerebral congestion, during which the consciousness and all mental manifestations are momentarily in abeyance. The eyes, reddened by injection of the conjunctiva, become fixed, and the expression becomes vacant; lids close con-

clusively, to exclude the light. In some, the breathing becomes panting and labouring; but in others, it is temporarily suspended, in consequence of laryngeal spasm, and the air, after being pent up for a time in the lungs, is finally forcibly expelled, and they utter incoherent and incomprehensible words."

The impulses proceeding from the congested nerve-centres are confused. There is an indescribable disorder both of motion and of sensation, the extremities are affected with convulsive twitchings, and may be either moved in various directions or extended straight and stiff; the jaws are pressed together so that the teeth grind against each other; and certain individuals are affected by erotic delirium to such an extent that they will seize the unguarded shoulder, for instance, of their partner in the sexual act, and bite it till the blood flows.

A period of exhaustion follows, which is the more intense in proportion to the intensity of the preceding excitement. The sudden fatigue, the general sense of weakness, and the inclination to sleep, which habitually affect the male after the act of intercourse, are in part to be ascribed to the loss of semen; for in the female, however energetic the part she may have played in the sexual act, a mere transient fatigue is observed, much less in degree than that which affects the male, and permitting far sooner of a repetition of the act. "*Triste est omne animal post coitum, praeter mulierem gallumque,*" wrote *Galen*, and the axiom is essentially true, at any rate so far as the human species is concerned.

The question has been mooted, and many earnest inquirers have devoted much thought thereto, whether in this moment of most intense sexual gratification it is the male or the female that experiences the greatest amount of pleasure. As in the case of all questions the data for the solution of which are at once very various and very variable, so in this case also, very different opinions have been put forward. "In fact," writes *Roubaud*, "when we take into consideration all the circumstances by which the intensity of sexual sensation is influenced, it may well be doubted if it is at all possible to find an a priori solution for the problem. When we take into consideration the influence exercised by temperament, constitution, and a large number of conditions both general and special, on sexual sensibility, we cannot fail to be convinced that this problem, in consequence of all the complicated characteristics it presents, is actually insoluble.

In regard to the pleasure experienced in the act of intercourse, a remarkable distinction is drawn by *Gutzeit*. The male, in every case and with every woman, experiences the full degree of pleasure; and even though from the mental point of view this pleasure may be enhanced by inclination, attraction, and mutual love, from the

physical point of view there is no difference between different acts of intercourse, so that the cynical old Roman was right when he wrote, "*Sublata lucerna nullum discrimen inter foeminas.*" But in the case of the female it is very different. Her first experience of sexual relations is a very painful one, and this pain prevents all enjoyment as long as it continues, as it does in many women for one, two, or even four weeks. And when this period is once over, not more than two women in every ten experience the pleasure of sexual intercourse in its full intensity. Of the remaining eight, four have indeed an agreeable sensation during the rubbing movements of the sexual act, but it is a long time before they experience a sensation analogous in its intensity to that which in man accompanies the act of ejaculation. In some women it may be six months after marriage before the true sexual orgasm is experienced, in others it may be a year, or even several years; in a considerable number this does not happen until after they have given birth to several children. As a result of numerous observations on this point, *Gutzeit* asserts that in women sexual pleasure is experienced only in intercourse with a man who is beloved, or against whom, at least, no repulsion is felt; and that no pleasure is felt by a woman in intercourse with a man towards whom she feels an actual dislike. Further, he maintains, that a woman, loving another man, and feeling pleasure in intercourse with him, has on the other hand no voluptuous sensations during intercourse with her husband, whose embraces she permits only from a sense of duty. Thus in the male, intercourse is always pleasurable, while in the female, pleasure is experienced only when certain conditions are fulfilled.

Contact with the male genital organs stimulates in the female the sensory nerves of the vulva, the vestibule, and the vagina; the nervous stimulus is transmitted to the cerebral cortex, where it gives rise to the sensation of sexual pleasure, and causes, through the intermediation of the genito-spinal centre, a number of reflex actions. As sensory nerve terminals of such reflex arcs, the final ramifications of the pudic branch of the sciatic plexus play the most important part; in the clitoris these nerves are beset with a peculiar kind of end-bulbs, the genital corpuscles discovered by *W. Krause*; from their structure these corpuscles seem admirably adapted to respond to the very slightest stimulation, producing voluptuous sensations and perceptions, and giving rise to various reflex manifestations. The first part of the path of the afferent impulses by which sexual pleasure is aroused is constituted by the dorsal nerves of the clitoris. The reflex changes consequent upon sexual excitement begin already in the vestibule, inasmuch as the secretion of Bartholin's glands, which are compressed by the action of the

constictor cunni muscle, is expelled during coitus, the secretion, owing to the situation of the orifices of Bartholin's ducts, passing over the external genitals. The clitoris becomes erect; the blood in the bulbs of the vestibule, the venous plexus situated around the margin of the vestibule along the boundary between the labia majora and the labia minora, is pressed into the glans clitoridis, the erection and sensibility of this structure being proportionately heightened. By the action of the constrictor cunni and ishiocavernosus muscles, the clitoris, the distal extremity of which is bent downwards at a right angle, is drawn down and pressed against the penis.

At the entrance of the vagina is the sphincter vaginæ muscle, whose action is reinforced by muscular fibres running in the middle coat of the vagina itself. It is probable that the muscular activity of the vagina and the uterus facilitates the entrance of the semen into the cavity of the uterus.

Dorsal decubitus is rightly regarded as the most correct position, physiologically speaking, for the woman to assume during coitus. That from the earliest times and in the most diverse races, this position has been customary, is shown by numerous antique paintings and statues, and by the reports of those who have studied the customs of savage races. Various other positions are, however, occasionally assumed; thus, *Ploss* and *Bartels* report, that among the Soudanese, coitus is practiced in the erect posture, with the man standing behind the woman; that among the Inuits (Eskimo), the act is performed in the manner usual among quadrupeds; that among the Swahelis in Zanibar, and among the indigens of Kamschatka, the lateral posture is customary; and that among the Australian blacks, coitus is usually effected in the crouching posture, both parties squatting on their hams. The same writers remind us, that in the old calendars of the fifteenth, sixteenth, seventeenth, and eighteenth centuries, definite commands and prohibitions for the conduct of marital intercourse are to be found, and that lucky and unlucky days, respectively, are specified for the performance of the act. These recommendations would appear to be relics of antiquity, for in the Sanscrit work *Kokogam*, under the heading "*Sexual Intercourse According to the Days of the Month*," exact instructions are given for the proper performance of coitus.

In the *Kamasutra* (the Indian *ars amatoria*, a work only in recent days rendered accessible to European readers in the translation of *R. Schmidt*), several chapters are devoted to the detailed description of the various methods of copulation, and rules are given for the carnal union of man and wife. But, as the Indian

author justly remarks, "Rules are of value only for the control of moderate desire; when the wheel of passion has once begun to roll, to prescribe a course is no longer of any avail." In this work, sixty-four varieties of erotic enjoyment are enumerated, and we find an *explicatio coitus secundum mensuram, tempus, naturam, de modis inter coitum procumbendi, de minis coitibus, de coitu inverso, de viri inter coitum consuetudinibus*.

At times, in order that coitus may be effective, some other position than the natural one is indispensable. Such a necessity has been recognized even by theologians, by whom any divergence from nature in this matter has usually been regarded as sinful. For instance, in the work of Craisson, *De Rebus Venereis ad Usus Confessariorum*, we read: "*Situs naturalis est ut mulier sit succuba et vir incubus, hic enim modus aptior est effusionis seminis virilis et receptioni in vas femineum ad prolem procreandum. Unde si coitus aliter fiat, nempe sedendo, stando, de latere, vel praeponere (more pecudum), vel si vir sit succubus et mulier incubus, innaturalis est. . . . Sed tamen minime peccant conjuges si ex justa causa situm mutant, nempe ob acgritudinem, vel viri pinquetudinem, vel ob periculum abortus; quandoque ait St. Thomas, sine peccato esse potest quando dispositio corporis alium modum non patitur.*"

In certain pathological states, as for the prevention of sterility, an abnormal posture during coitus may advantageously be recommended, in order to favour the entrance of the semen into the cervical canal, and to allow the semen to stay longer in the vagina before it flows out. An old and often efficacious means for this purpose is the performance of coitus with the woman in the knee-elbow posture. In order to favour the entrance of the semen into the deeper portion of the genital tract, Hegar and Kaltenbach recommend that after coitus the woman should remain for some time in the knee-elbow posture, while the man from time to time gently presses up the anterior abdominal wall, and then abruptly relaxes the pressure.—In the *Talmud*, coitus was regarded as unfruitful if performed when the woman was in the erect posture.

Casper reports the case of a woman with severe scoliosis, who had long remained sterile, and who only conceived (and was subsequently happily delivered) after performing coitus in the abdominal decubitus.

Guéneau de Mussy suggests the following, very characteristic, method of ensuring fertilization, one which also certainly dates from great antiquity: "*Sed haud illicitum mihi visum est, si post diversa tentamina diutius uxor infecunda manserit, ipsum maritum digitum post coitum in vaginam immittere, et ita receptum semen uteri osteo admove. Et cum ostiolo uteri haeret, ut in perivium*

canalem spermatozoidum motibus faventibus, prodeat, sperare non absurdum." Eustache reports a case, the wife of a physician, in which this manoeuvre was effective in ensuring conception.

A similar procedure has been employed with success by Kehler, in a case of enfeebled potency on the part of the male, leading to premature ejaculation. A speculum was introduced into the vagina, and through this instrument the semen, ejaculated in consequence of sexual excitement, was introduced into the vaginal fornix; conception ensued. In an analogous manner, A. Peyer recommended, in a case of partial impotence, in which special manipulations were needed to bring about ejaculation, that conception should be favoured in the following manner: Erection having been effected by ordinary sexual contact, the manipulations needed to produce ejaculation were carried out, and the penis was intromitted into the vagina the moment before ejaculation occurred. This has been done with fruitful results. Englisch reports the case of a hypospadiac who, in order to render coitus effective, used a condom in the anterior extremity of which he made an aperture. In this way he became the father of three children.

In very obese men with extremely protuberant abdomens, we may recommend for the furtherance of conception that they should have intercourse with their wives *a parte posteriori*; and the same recommendation may be made in cases in which the wife herself is extremely obese. In Australia, it is said that among the indigens, coitus is usually practiced *a posteriori*; and there is a saying in the Talmud to the effect that sexual intercourse performed in the ordinary manner does not lead to the conception of infants so good, wise, talented, and promising as those whose conception is the result of coitus *a posteriori*. Mohammed, on the other hand, declares, "Your wives are your tillage, go therefore unto it in whatsoever manner ye will."

In cases of retroflexion of the uterus, with a markedly forward direction of the vaginal portion of the cervix, I have recommended to the husband that he should perform coitus with his wife in the upright sitting posture. In this posture the fundus uteri passes downwards and forwards, whilst the vaginal portion of the cervix passes upwards and backwards.

In cases of retroversion of the uterus with the formation of a cul-de-sac in the posterior vaginal fornix, Pajot recommends, with the aim of temporarily restoring the uterus to a position in which the occurrence of conception is favored, that for three or four days prior to coitus the patient should retain the fæces, eating the while freely of eggs and rice, and taking a small opium pill every evening; in cases of anteversion, the patient should retain her urine for

a considerable time—five or six hours—before coitus; and in cases of lateral version he recommends that the patient should have intercourse while lying on that side towards which the vaginal portion of the cervix is directed.

Edis recommends that in cases in which there is sterility dependent upon backward displacements of the uterus, that the organ should be replaced while the patient is in the genu-pectoral posture, and a pessary inserted; coitus should then be effected without the patient's changing her posture.

In the human species as compared with the lower animals, there has been a notable diminution in the frequency of the separate acts of intercourse, a diminution dependent upon the higher vital aims of the former. *Burdach* formulates as a physiological law that the frequency of sexual intercourse is inversely related to the duration of the act.

Amongst all civilized races, sexual intercourse ceases during menstruation, since in the normal man there is aversion to intercourse with a menstruating female.

By the Mosaic law, intercourse with a woman during menstruation and for seven days after the cessation of the flow, was forbidden under pain of death. The *Talmud* further ordains that a purifying bath shall be taken by the woman a week after menstruation. By intercourse itself, moreover, both man and woman were rendered unclean to the evening; and, according to the Mosaic law, both must bathe after the act of coitus. In the *Koran*, also, intercourse is forbidden during menstruation, and until the woman has been purified with water. The laws of Islam demand from a man who marries a virgin that he shall have intercourse with her the first seven nights in succession; whilst he who marries a wife no longer virgin, needs to visit her only the first three nights in succession. Subsequently, during married life, the Mohammedan shall have intercourse with his wife regularly once a week. Amongst many savage races, intercourse is forbidden with a woman during pregnancy, the puerperium, and lactation.

The first act of intercourse is difficult and painful to the virgin. At times the rupture of the hymen is exceedingly difficult. Even after this, it is some time before genuine pleasure is experienced in sexual intercourse.

To the female, intercourse is harmful when performed with undue frequency, or during menstruation, or indiscriminately throughout pregnancy, or during the puerperium, or incompletely or in an unnatural manner, or finally when performed in an unsuitable bodily attitude.

"Unduly frequent performance of the act of coitus," writes *Hegar*, "which is liable to occur either in marital or in illicit inter-

course, gives rise to anæmia, defective nutrition, muscular weakness, intellectual and nervous exhaustion. Young and healthy individuals recuperate rapidly after excesses of brief duration, as is often seen in young married pairs. Sickly and elderly persons, on the other hand, are much more severely affected by sexual excess, and recover therefrom but slowly if at all. Long continued sexual excesses ultimately wear out even the strongest."

Intercourse effected by force, or with a girl of immature age, is distinguished as rape, a punishable offence both in Germany and in Austria. The offence is defined as extra-marital intercourse with a female under the age of fourteen years, with or without the latter's consent; or extra-marital intercourse with a female of any age against her will or deprived of the power of resistance — either by the use of actual force, by the employment of threats, or by loss of consciousness. With regard to the last specification, the law regards as rape intercourse with a woman unable to resist through loss of consciousness, whether that loss of consciousness is or is not produced by the direct action of the violator.

In the female, the act of intercourse, alike physically, in its natural consequences, and mentally, is at once more difficult and of more enduring results than in the male. A writer of the new school, who according to his own admission has no other interest than the study of the sexual life, writes of himself: "I have often enough had intercourse with members of the other sex, in a few cases, indeed, out of pure inclination; but in all cases alike the aim and the result were the same — as soon as I had gained my end, the affair was finished. Passion, a bestial act, exhaustion, commonly a feeling of loathing; in the best possible case a fugitive but not an agreeable memory; voilà tout." To women, such a description, happily, is applicable only in the most exceptional cases.

With the completion of coitus, the voluntary and conscious action of the two parties to the act is at an end; the subsequent stages of the function of generation are independent alike of consciousness and will.

When complete intromission of the penis has been effected, and ejaculation takes place, the semen is usually deposited at the os uteri or in the immediate neighborhood of that orifice. During the act of ejaculation, a peristaltic contraction of the vagina occurs, by means of which the semen at the os uteri is subjected to a moderate degree of pressure; the contraction and the pressure may perhaps persist for some little time after the completion of the coitus. In rabbits on heat, such contractions of the vagina, by means of which the semen was forced under pressure into the interior of the uterus, have been actually observed.

During coitus, the uterine muscle is also active. During strong

sexual excitement, the uterus descends in the pelvis, the downward movement being increased by the pressure on the woman's abdomen. The os uteri externum is drawn open, and the aperture, hitherto flattened, now becomes rounded. At the same time, the secretion of the cervical glands is expelled, and small quantities of semen are sucked into the cervical canal. The *plicae palmatae* offer a certain hindrance to the entrance of the semen; but the surface of the interior of the canal is rendered much smoother by the free secretion of mucus by the cervical glands. Further, it appears highly probable that during the excitement of coitus, the mouths of the Fallopian tubes, ordinarily more or less tightly closed, become widely opened, so that the entrance of the spermatozoa is favored.

The muscular movements of the uterus were observed by *J. Beck* in a woman suffering from prolapse. During sexual excitement, the os uteri opened and closed rapidly five or six times in succession, remaining at last firmly closed. Further, in bitches on heat, *Basch* and *Hoffmann* observed the vaginal portion of the cervix to descend in the vagina, the os uteri opened, mucus was extruded, and the os was then retracted.

Hohl, *Litzmann*, and others have reported, that in women endowed with great nervous susceptibility, friction of the vaginal portion of the cervix with the finger arouses sexual sensation, with rounding of the os uteri externum, descent of the uterus, and hardening of the vaginal portion; this latter is regarded by *Graily Hewitt* and by *Wernich* as a necessary accompaniment of copulation. *Henle* believes that the hardening and protrusion of the vaginal portion of the cervix are due to a change in the tension of the delicate vessels of this structure, which have an exceptionally thick muscular coat; *Rouget* compares the mechanism with that by which erection of the penis is produced. These authors consider that sexual excitement is indispensable for the erection of the vaginal portion of the cervix.

Thus, *Hohl* writes: "Numerous observations have shown that in females endowed with a considerable degree of nervous susceptibility, and especially in nulliparae, during examination and during any increasing irritation, not only is there an increased secretion of the vaginal mucus, but also a momentary descent of the uterus and an opening of the os uteri externum, so that this orifice has the appearance for the instant of the open mouth of a tube. *Litzmann* reports that during the vaginal examination of a young, extremely erethistic woman, the uterus suddenly assumed a more vertical position, and came lower down in the pelvis; at the same time, the lips of the cervix became equal in length, the os uteri externum became rounded, soft, and penetrable by the finger;

whilst the breathing and the voice indicated the occurrence of intense sexual excitement. *Rouget* assumes that the body and the fundus of the uterus constitute an erectile organ, which however possesses capability for erection only during the period of ovulation; *Hewitt*, on the other hand, considers it extremely probable that the erection may occur at any time during sexual intercourse, whether ovulation is proceeding or not. *A. Wernich* considers, basing his views in part on personal observations, that erection of the lower segment of the uterus occurs, like erection of the penis, whenever a moderate degree of sexual excitement is experienced; in women, however, he believes that erection is seldom extreme, and that it declines with the other symptoms of sexual excitement, viz., flushing of the face, moisture and glistening of the eyes, peculiar groaning expiration, etc. Whereas during ovulation, erection is merely a necessary concomitant of the other menstrual processes; during coitus, erection not only occurs much more powerfully, but it is also an important—perhaps the most important—contributory factor in effecting fertilization.

It is no longer possible to accept the view of earlier physiologists that the purpose of this erection of the lower segment of the uterus is "to constitute with the penis a continuous canal between the male and the female genital organs." Contact between the glans penis and the os uteri externum is not indeed an occurrence of extreme rarity; but, on the other hand, it is in no sense a constant nor even a frequent incident of sexual intercourse. It is ejaculation, especially, which is subserved by the erection of the vaginal portion of the cervix. In the female, ejaculation occurs at the moment of the most intense sexual pleasure, and is marked by the evacuation from the os uteri externum of a moderate quantity of mucous fluid with an alkaline reaction. In some cases, in which a chronic discharge of this cervical mucus occurs, it forms an elongated coagulum of delicate vitreous jelly, the "mucus-string" of *Kristeller*. The last-mentioned author is of opinion that the spermatozoa slowly, but by active movements, find their way along this string into the cavity of the uterus. This assumption, however, is met by *C. Mayer* and *Marion Sims* with the objection, that *Kristeller's* observations were for the most part carried out on women who were out of health, and that a gelatinous secretion of this character obstructs the orifice of the cervical canal, and hinders the occurrence of conception. From the erection of the portio vaginalis during sexual excitement, and its sudden relaxation post cohabitationem, *Wernich* deduces the occurrence of a process of aspiration, by which the semen is drawn up through the cervical canal into the cavity of the uterus; a process which has been seen

in actual occurrence in vivisected animals. It is said that to many women this feeling of a process of suction is so well known, that thereon, in association with the consequent almost complete absence of mucus and seminal fluid from the vagina, they are accustomed to base a belief that conception will occur. It is said that this aspiratory activity on the part of the uterus may be perceived during coitus by the male also (?). It is assumed by *Grohe* that the wave motion of the cilia of the epithelium lining the cervical canal, is of importance in promoting the ascent of the spermatozoa; it may be that the vibration of the cilia exercises a motile stimulus on the spermatozoa, it may be that the continually repeated stroke of the cilia serves to prevent the permanent agglutination of the spermatozoa into groups.

According to *Sims*, the aspiratory action of the uterus is effected in the following manner: By the contraction of the constrictor vaginae superior muscle, the cervix is pressed downwards against the glans penis, and by this pressure its contents are evacuated; the parts then relax, the uterus suddenly returns to its normal state, and thus the seminal fluid with which the vagina is filled is drawn into the interior of the cervical canal.

Eichstadt also attributes to the uterus an aspiratory force, dependent upon coitus, and competent to force into the interior of the uterus the semen ejaculated into the os uteri. The changes in the uterus which are the necessary antecedents of this aspiration, namely, an engorgement with blood whereby the flattened form of the uterus gives place to a more rounded form, and the cavity of the organ is increased in capacity, take place, in the opinion of this author, only when during intercourse the woman has attained the acme of sexual gratification, by which alone can the aforesaid change in the uterus be brought about. *E. Martin* and *Chrobak* have also directed attention to the fact, that some importance in this connexion must be attached to the facultative enlargement in the size of the os uteri externum.

Lott, by his researches into the behaviour of the cervix uteri in relation to the act of conception, is led to the conclusion that the locomotive capacity of the spermatozoa forms the principal factor in effecting a fertilizing contact between the spermatozoa and the ovum. This locomotive capacity may be increased or diminished by a number of conditions, among which the principal are: the activity of the cervix uteri (the ciliated epithelium); the character of the secretions; and the position, shape, and size of the cervix.

Thus, this author concludes, the part played in conception by the normal cervical canal is a purely passive one, with the sole exception of the activity of the ciliated epithelium — and the influence of this factor must be regarded as extremely doubtful. That during ejaculation the external orifice of the male urætha and the os uteri externum are in close apposition, is denied by *Lott*, who adduces in support of his views data derived from comparative investigations on various animals. In the dog, the configuration of the genital organs is such that it is impossible to suppose that any apposition can occur; the same is the case with the sheep; and still more so with the rabbit, who possesses two quite distinct portiones vaginales, projecting freely into the vagina. In the human species also, the character of the walls of the cervical canal, where in the normal state the plicae palmatae may almost be said to interlock, separated only by a thin stratum of mucus, offers a hindrance to the entrance of the ejaculated semen by the direct force of ejaculation itself. As regards the independent motile powers of the spermatozoa, the researches of *Lott* showed that not only can they overcome strong capillary currents, and can traverse the width of a coverglass (18mm.—about $\frac{3}{4}$ in.) in about five minutes; but further that they are capable of migration through the finest interstices (those of an animal membrane) provided that the fluid with which the membrane is moistened is one favourable to their vital activity.

Kehrer, who in general supports the view that the *modus coeundi* and an active attitude on the part of the female have an important influence on the occurrence of conception, assumes that independent contractions of the cervix occur, whereby is expelled the delicate plug of mucus that fills the cervical canal and offers an obstacle to the passage of the spermatozoa. He believes that the duration of the act of intercourse, the mechanical relations between the penis and the vagina, the activity of the uterine muscle, the secretory activity of the utero-vaginal mucosa during the act, and the posture of the female *post coitum*, are all important factors in the occurrence of conception. Thus, he believes that if during intercourse there is a failure of the uterine contractions, which should expel the plug of cervical mucus, the semen flows away without effecting fertilization; if an unsuitable posture is assumed during intercourse the woman remains sterile, but can be fertilized without difficulty by coitus effected in the proper manner.

Hausmann has shown, that in the same woman, and in similar conditions, spermatozoa will on one occasion be found in the cer-

vical canal, and on another occasion will not be found there; and he has further shown, that in some women we fail to find spermatozoa in the cervical canal in circumstances in which, in other women, we regularly find them in that situation.

Far as we may be from a complete knowledge of the conditions upon which conception depends, this at least is certain, that the passage of spermatozoa through the os uteri externum is a *sine qua non* of fertilization. Indeed, it would seem that we must accept as true the assumption of *Meyerhofer*, that fertilization is possible only if the semen passes at once into the cervical canal, mingles, that is, at once with the alkaline cervical mucus — unless, indeed, the coitus takes place during the catamenial flow, when the blood has neutralized the acid reaction in the vagina, or takes place when some morbid condition has had the same result. The theory of *Johann Müller*, regarding the piston-like action of the penis during coitus, by which the semen is actually forced through the cervix, must be rejected; equally unsound is *Holst's* assumption that during intercourse the semen is ejaculated through the enlarged cervical canal directly into the cavity of the uterus. It would appear, however, to be a necessary condition of fertilization, that the semen should be ejaculated into the uppermost segment of the vagina, so that the fluid comes into actual contact with the os uteri externum; it may be that the alleged aspiratory force of the uterus then comes into play, by means of which the semen is sucked into the cavity of that organ; it may be, on the other hand, that *Beigel* is right in his theory of the existence of a *receptaculum seminis*, formed by the anterior and posterior lips of the cervix uteri and the uppermost segment of the vagina — in this space, he supposes, a part of the semen is retained in contact with the orifice of the cervical canal.

It is, also, exceedingly probable that during coitus a reflex nervous mechanism becomes active, by means of which the uterine orifices of the Fallopian tubes are opened, the vaginal portion of the cervix descends in the vagina, the os uteri externum enlarges, the orifice becoming rounded where before it was flattened, and finally small quantities of semen may be aspirated into the cavity of the uterus.

I further regard it as important in promoting conception, that simultaneously with the changes above described, the reflex nervous stimulation should lead to the secretion by the cervical glands of a gelatinous material, alkaline in reaction, and therefore adapted

to increase the locomotive powers of the spermatozoa, so that these latter, aided by the activity of the ciliated epithelium lining the cervical canal, will gain the interior of the cavity of the uterus, and thence pass onwards to the Fallopian tubes. The significance of the glands in the mucous membrane lining the cervical canal has hitherto been underestimated in this connexion.

Whereas in the primitive state of mankind, among savage races at the present day, as among our own prehistoric ancestry, nakedness is the rule, so also intercourse in these circumstances is effected altogether without any regulation by law or custom, on the mere prompting of unbridled natural passion, and, moreover, there is the fullest promiscuity in sexual relations; but civilization has led man to impose restraints upon sexual intercourse, and has introduced marriage as a sacred institution. Among certain primitive peoples, however, among whom the wives are common to all the men, transitory pairings nevertheless occur, especially when a woman becomes pregnant; to cease, however, during the period of lactation. "This is the origin of marriage, which has evolved from rape and prostitution, as law has evolved from crime" (*Lombroso*). This author makes an interesting observation when describing the entire freedom of sexual intercourse that obtains among the Red Indians of North America, to the effect that "often, times of general promiscuity occur, as with rutting animals, generally in the warm season of the year, when nutriment is abundant; it is difficult to indicate any distinction between the tumultuous orgies of the baboon, and those of the Australian Blackfellows, among whom the sexes keep apart during the greater part of the year, to intermingle like rutting beasts during the season of the yam-harvest."

The paths of civilization, from the complete promiscuity of sexual intercourse to the lofty ideal of life-long monogamic union, has not been a straightforward one, but has been marked by various aberrations of sexual relationship; hetairism, prostitution, polyandry, incest, rape, the *jus primae noctis*, etc. The anthropologist is able to trace the successive stages of the development of the institution of monogamic marriage; the community of wives within the clan; free sale of wives and daughters; bestowal of a man's wife or concubine for the honour of a guest; ritual prostitution for the honour of the gods and at numerous religious festivals; æsthetic and literary hetairism, with bestowal of favours according to free inclination; community of wives among all males of the same family; the

claim of the wife to as many as five or six husbands; the right of brothers to their sisters; the defloration of virgins by the priests in heathen temples; the temporary possession of the wife by the chief of the community, prior to her possession by her permanent husband; defloration of the bride by the bonze before her marriage; the feudal right of the mediæval seigneur to the *prima nox* of the bride of his retainer.

In the lower stages of civilization, copulation appears so natural an action that it is performed in public entirely without shame. Thus, *Cook*, in his first voyage, describes having seen an indigen engage in sexual intercourse with a girl of eleven years, under the very eyes of the queen, with whom *Cook* was then having audience; the sexual act was, according to *Cook*, the favourite topic of conversation between the sexes. *Herodotus* reports that many peoples of antiquity had no regard for privacy in sexual intercourse, but that, like the lower animals, they had connexion in any company. In the *Bible*, also, it is recorded that sexual intercourse was practised in public: "So they spread Absalom a tent upon the top of the house; and Absalom went in unto his father's concubines in the sight of all Israel." (II. *Samuel*, XVI. 22.) According to *Athenæus*, the Etruscans, at their public banquets, were equally unrestrained. *Plutarch* reports that among the Spartans the maidens and the young men went about naked together. Even, indeed, after the sense of modesty had begun to develop, it was long before any secret was made about the act of intercourse. In classical antiquity, it was very frequently the subject of pictorial and plastic representation. Even in more recent days, there have been artists who have not hesitated to depict the sexual act: thus we have the *Venus with a Faun* by *Caracci*; the *Jupiter and Io* of *Correggio*; the *Leda and the Swan* of *Tintoretto*; and similar pictures by *Luca Giordano*, *Rubens*, *Titian*, and *Franceschini*.

Even in the early centuries of the Christian era, the sect of the Adamites practised intercourse openly in the light of day, on the ground that that which was right in the dark, could not be wrong in the light. The same is reported of the sect of Turlupins, in France in the fourteenth century. We cannot refrain from quoting at length from *Lombroso* and *Ferrero* a passage relating to the evolution of sexual manners in the female sex (*Woman as Criminal and Prostitute*): "In the lowest stages of development, the feeling of modesty is entirely wanting; limitless freedom in sexual intercourse is the general rule; and even where no system of

promiscuity prevails, marriage rather fosters than discourages prostitution, especially in countries in which husbands are accustomed to expose their wives for sale. This fact may be brought into relation with the well known lasciviousness of apes and other animals high in the scale, showing that sexual excitability increases *pari passu* with intelligence, so that to man it is as impossible as to an ape to satisfy his sexual needs with a single female. Whilst among the apes, a single male possesses a number of wives, we find in the gregarious life of primitive man that community of wives has taken the place of polygamy, which institution, however, reappears in a higher stage of culture for the benefit of the more powerful masculine natures.

"To the dominion of prostitution as a normal institution succeeds the period in which it persists as a variously metamorphosed survival: it may be as the duty of the wife to surrender her person to any other male of the same family; or the woman may have to bestow her favors on a religious or political chief, as in the institution of temple-prostitution, where the wife must give herself, it may be to any one and at any time, or it may be to defined persons only and at stated festivals. Frequently we meet with another development of prostitution, finding that while the wife must remain chaste, the unmarried woman is allowed unrestricted intercourse; or, again, the wife at certain definite periods may dispense with fidelity to her husband, and return to the primitive condition of promiscuity. In certain instances prostitution is combined with the duties of hospitality, and marriage, though approximating to the monogamic ideal, must tolerate the intrusion of the guest into the marriage bed."

"In a third period, prostitution no longer fills the place of a traditional survival, but is a morbid manifestation confined to a certain class of the community. But bridging this transition of prostitution from a normal to a morbid manifestation, we have the remarkable phenomenon of aesthetic prostitution. Thus, in India and in Japan, an agreeable class of prostitutes practices the arts of singing and dancing, and forms a privileged caste; similarly, in the most flourishing period of Grecian culture, the leading men of the time formed a social circle around the hetairæ, from whom they derived a fruitful stimulus to intellectual and political activity. In this respect, history repeated itself in Italy in the sixteenth century. Alike in classical Greece and in mediæval Italy, this aesthetic prostitution fanned the flames of a period of intense spiritual activity —

for in individuals as in races, intellectual quickening is ever accompanied by erotic excitability."

The unbridled passion of the primitive races of mankind, the coercive love of beauty felt by the ancient Greeks, the swelling flood of erotism of the great mass of people of all times, is gradually guided into the quiet channel of the marriage bed; and even though monogamic marriage is incapable of fully providing for all manifestations of sexual passion, still, from the medical point of view, we must maintain that marriage is for women the most hygienic and the most proper means of gratification of the sexual impulse.

Conception.

The union between ovum and spermatozoön, whereby fertilization is effected, appears to occur in the human species as a rule in the outer third of the Fallopian tube, the ampulla of this structure (*receptaculum seminis* in *Henle's* terminology) serving to store the semen for a considerable period; in the lower animals, the usual occurrence of fertilization in this region has been established by direct observation. The open mouth of the tube receives the mature ovum, guided thither from the ovary by appropriate movements of the ovarian fimbriae; these movements have been seen in active occurrence in the guinea pig by *Hensen*. Once within the tube, the onward movement of the ovum is effected by the cilia of the epithelium lining of the canal.

His has formulated the theory that in the human species fertilization is possible only in the uppermost segment of the tube; an assumption that is probable enough, but cannot be regarded as definitely established. An analogy certainly exists among the lower divisions of the animal kingdom, for *Coste*, *His*, and *Ohlschläger* have proved that an ovum which passes through the Fallopian tube without being fertilized, undergoes notable alterations. Further, *Coste* has shown, in the case of the ovum of the domestic fowl, that this is no longer capable of being fertilized after it has passed through the upper segment of the oviduct. Other authorities, however, namely *Löwenthal*, *Mayrhofer*, and *Wyder*, oppose the extension of this rule to the human species. *Löwenthal* assumes that in the human female, fertilization ordinarily occurs in the cavity of the uterus, in the wall of which the unfertilized ovum has already embedded itself; and he supports his contention by the statement that spermatozoa are not to be found in the Fallopian tubes or on the surface of the ovaries. *Mayrhofer* and *Wyder* point out that

the movement of the cilia of the ciliated epithelium is in the interior of the uterus in an upward direction, but in the Fallopian tubes is downwards in the direction of the uterus.

The contention of *Löwenthal* was disproved by *Birch* and *Hirschfeld*, who, in a prostitute dying during the act of intercourse, found, fifteen hours after death, living spermatozoa in the Fallopian tubes. On the other hand, more recent investigations, those, for instance, of *Hofmeier*, *Mandl*, and *Bonn*, have confirmed the data given above with regard to the direction of the ciliary movement in the interior of the genital passages. Moreover, *O. Becker* has shown that the ciliated epithelium of the tubes extends over the fimbriae and even on to the adjoining pavement epithelium of the peritoneum; and he believes that the ciliary movement of this region keeps up a constant current, the purpose of which is to sweep the ovum into the ostium of the tube, and thence down towards the uterus. *Lode* has adduced positive experimental evidence of the occurrence of such a movement of translation.

The general result of anatomical investigation is, that the conjugation of the ovum with the spermatozoön takes place in the ampulla of the Fallopian tube; but it is established that fertilization may also take place lower down in the tubes, or in the uterine cavity, or even on the surface of the ovary, *i. e.*, in the abdominal cavity.

The fertilization of the mature ovum — maturation having occurred within the ovarian follicle before its rupture — has been shown by numerous researches on the ova of other animals to consist in the fusion of the male and the female nuclear substance; and it appears that of the enormous number of spermatozoa, estimated by *Lode* at 226 million at a single ejaculation, that enter the female genital passage, but a single one penetrates the ovum. Towards the head of this spermatozoön there extends from the surface of the ovum a process, flat at first, but becoming more and more prominent, until it surrounds the head, and fuses with it. The motile tail of the spermatozoön disappears, whilst the head, which has now passed through the vitelline membrane and entered the ovum, assumes the appearance of a nucleus, and is called the *male pro-nucleus*. The original nucleus of the ovum has previously prepared itself for fertilization by the extrusion through the vitelline membrane of portions of its substance (known as *polar globules*), and now constitutes the *female pro-nucleus*. Towards this latter, situated somewhere near the centre of the cell, the male pro-nucleus continues to move, the vitelline granules meanwhile being disposed

round about it in radiating lines, forming a star-shaped figure. Having come into contact, the two pro-nuclei fuse completely to form a new nucleus, the nucleus of the now fertilized egg-cell. The result of fertilization is the formation of the first *segmentation-*

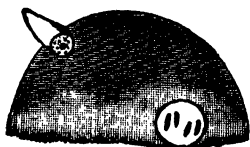


FIG. 55A.—First Stage.

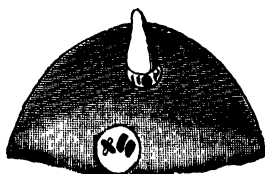


FIG. 55B.—Second Stage,

Entrance of a spermatozoon into the ovum of *ascaris mezalocephala*. After preparations by M. Nusbaum. (Half of the ova only are depicted.)

sphere, from which, by further subdivision, the new individual is formed. Thus is effected that which *Hippocrates* describes in the words: "The seed possessed both by man and by woman, flow together from all parts of the body; the fruit is formed by the mingling of the two seeds."

The most favourable period for the occurrence of fertilization appears to be when intercourse takes place from eight to ten days

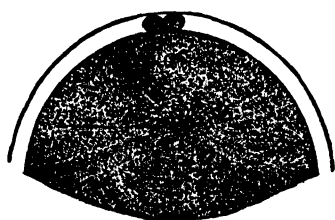


FIG. 56.—Ovum of *Asterakanthion* ten minutes after fertilization.

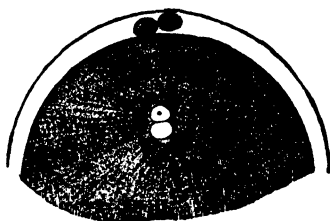


FIG. 57.—Fusion of male pro-nucleus and female pro-nucleus to form the segmentation nucleus of the fertilized ovum.

after the termination of the menstrual flow. In 248 instances in which the date of the fruitful coitus was exactly known, it was ascertained by Hasler that in $82\frac{1}{2}$ per cent. of all cases, conception was effected in the fourteen days succeeding the menstrual period. In general it may be stated that the theory of the periodicity of ovulation and of the causal relation of this process to menstruation, has not been shaken by the result of researches recently undertaken

by opponents of that theory; hence it appears that the fertilized ovum is the ovum of the last completed menstruation.

Already in the writings of the old Indian physician *Susruta*, we find expression of the view that the period that immediately succeeds the cessation of the menstrual flow is one most favourable to conception. "The time of generation," he says, "is the twelfth night after the commencement of menstruation." In the Jewish *Talmud*, the day before the onset of menstruation, and the days immediately succeeding the cessation of the flow, are indicated as those most favourable to the occurrence of conception; moreover, in the *Talmud*, notwithstanding the fact that intercourse during menstruation is prohibited on pain of death, and that coitus is not



FIG. 58.— Passage of spermatozoon through the zona pellucida of the ovum of *Asterakanthion*.

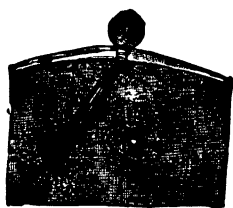


FIG. 59.—Ovum of *scorpæna scrofa* thirty-five minutes after fertilization.

regarded as permissible until the lapse of twelve clear days after the cessation of the flow, nevertheless the assertion is made that intercourse during menstruation may lead to conception.



FIG. 60.— Male pro-nucleus and female pro-nucleus in fertilized ovum of frog, prior to the formation of the segmentation nucleus.

Hippocrates writes: *Hac nempe post menstruam purgationem utero concipat.* *Aristotle* says: *Plerasque post mensum fluxum nonnullas vero fluentibus adhuc menstruis.* *Galen* writes: *Hoc autem conceptionis tempus est vel incipientibus vel cessantibus menstruis.*

Soranus writes to a similar effect: Just as the soil is suitable only at certain seasons for the reception of the seed, so also in the human race intercourse does not always take place at a time suited for the reception of the semen. To be effective, coitus must occur at the proper time. . . . The act of intercourse that is to lead to conception may best occur either just before or just after the menstrual flow, when, moreover, there is strong desire for the sexual embrace, and neither when the body is fasting, nor when it is full of drink and undigested food. The time before menstruation is, however, unsuitable, for then the womb is heavy from the flow of blood, and two conflicting tendencies will come into operation, one for the absorption of material and the other for its outflow. During menstruation, again, conception is unlikely to occur, for then the semen is wetted and washed away by the flowing blood. The sole proper time is that immediately after the flow, when the womb has freed itself from its humours, and warmth and moisture stand in harmonious relationship.

Among many of the castes of Hindustan, it is a religious ordinance that on the fourth day of menstruation a man shall have intercourse with his wife, "since this day is that on which conception is most likely to occur." Indian physicians advise, in order to bring about conception, "that coitus be effected always as soon as the menstrual flow has ceased, at the end of the day, and when the lotus has closed." In Japan, medical opinion is to the effect that a woman is capable of conceiving during the first ten days after menstruation, but not later (*Ploss and Bartels*).

The view that the first days of the inter-menstrual interval are those most favourable to the occurrence of conception, is further confirmed by the statistical data collected by *Löwenfeld, Ahlfeld, Hecker, and Veit*; and it appears that as the date of the next menstruation is approached, there is a continual decline in the frequency of conception; just before the flow, conception hardly ever occurs. *Hensen*, from the records of 248 conceptions in which the date of the fruitful intercourse was exactly known, draws the following conclusions:

1. The greatest number of conceptions follow coitus effected during the first days after the cessation of the menstrual flow.
2. When coitus is effected during menstruation, the probability of conception increases day by day as the end of the flow is approached.
3. The number of conceptions following coitus effected shortly before menstruation is minimal.

4. However, there is no single day either of the menstrual flow or of the inter-menstrual interval, on which the possibility of the occurrence of conception can be excluded.

Feokstitow has drawn up from statistical data an ideal "conception-curve," which teaches that conception most readily ensues upon coitus effected soon after the end of the menstrual flow, in the first week, that is to say, of the inter-menstrual interval; moreover, the curve shows that the highest percentage of conceptions occurs on the very first day after the cessation of the flow, and that after this day the percentage of conceptions declines. The percentage frequency of conceptions from coitus effected on the last day of menstruation, and on the first, ninth, eleventh, and twenty-third days, respectively, of the inter-menstrual interval, is expressed by the ratio 48:62:13:9:1; and between the points given, the course of the curve is almost rectilinear. The probability of the occurrence of conception on the twenty-third day of the interval (on which day the curve reaches its lowest point), is one-sixty-second of the maximum probability.

The proper performance of coitus depends upon the *potentia coeundi* of the male; the attainment of conception depends upon his *potentia generandi*. The *potentia generandi* demands from the man the functional competence of the testicles, the perviousness of the seminal passages (namely, of the vasa deferentia and the urethra), the secretion of a normal semen, and, finally, a proper formation of the penis, whereby during ejaculation the semen may be deposited in sufficient proximity to the os uteri externum.

Normal semen is a whitish, semi-transparent fluid, of the consistency of thin cream. It contains aggregations of a nearly spherical shape, consisting of a vitreous, transparent, colourless or light yellow, gelatinous, elastic substance. Under the microscope this substance has a hyaline appearance, and exhibits in its interior innumerable clear spaces of varying size, which are apparently filled with a clear fluid. Not infrequently, these spaces are extremely narrow and therewith greatly elongated and disposed in parallels, so that the whole substance thus obtains a striated appearance. When treated with water, this material becomes whitish and non-transparent, and assumes under the microscope a finely granular aspect. When allowed to stand without agitation for twenty-four hours, this substance dissolves and becomes so intimately mingled with the seminal fluid that it can no longer be clearly differentiated therefrom. In all probability it is merely a secretory product of the seminal vesicles.

often forming beautiful star-shaped figures. They are soluble in mineral and vegetable acids, and in ammonia, but are insoluble in alcohol, ether, and chloroform; they are remarkably resistant to the solvent powers of cold water, but not so to those of boiling water. *Shreiner* has proved that these crystals consist of a phosphate of a base which is represented by the formula $C_2. H_5. N$. According to *Fürbringer*, these crystals are produced as a result of the action of the semen upon the prostatic secretion.

The quantity of semen ejaculated during coitus is very variable, depending upon the age and size of the individual and the formation of his testicles, upon his individual sexual capacity, and upon the question whether antecedently there has been sexual excess on the one hand or long continued continence on the other. In general, the quantity of semen ejaculated at one time varies between 0.75 and 6 c.c. (10 to 100 minims).

If healthy, normal semen, with adequate fertilizing potency, is properly preserved from cold and light, we may, even after the lapse of twenty-four hours, find under the microscope spermatozoa still engaged in active movement. *Ultzmann* employs for the description of a drop of fresh semen, the comparison that it is full of movement, "like a stirred up ant-heap." Influenced by the whip-like lashings of the tail, the spermatozoön moves steadily forwards, finding its way through the narrowest passages on the microscopic field without striking any of the cellular structures that may lie in its path. The longer the semen remains under observation, the less active are these movements of the spermatozoa, for after ejaculation they gradually die, exhibiting after death an extended, or at most a slightly curved tail; those spermatozoa, on the other hand, that were dead before ejaculation, have the tail spirally twisted, rolled up, or acutely bent. In the case of spermatozoa which have been destroyed by the action of some other deleterious secretion, as by urine or by acid vaginal secretion, such a condition of the tail is very commonly seen. When the semen is treated with water, the movements of the spermatozoa soon cease, and the ends of their tails frequently roll up to form loops. By the addition, however, of concentrated solutions of neutral salts, of albumen, of urea, etc., it is possible to reanimate these motionless spermatozoa, so that they once more are seen to perform active movements. Moderately concentrated animal secretions of an alkaline reaction are favourable to the motor activity of the spermatozoa, whilst on the other hand dilute and acid secretions, such as urine, acid mucus (including the

acid vaginal mucus), and catarrhal secretions, even when alkaline in reaction, have a depressant influence on this activity. Caustic potash and caustic soda stimulate the movements of the spermatozoa. When they are cooled down to a temperature below 15° C. (59° F.), the movements cease entirely. Salts of the heavy metals, and mineral acids in solution, also bring their movements to a pause. Frequent repetition of coitus causes a diminution in the number and in the motor activity of the spermatozoa.

Semen which contains no spermatozoa, or in which the spermatozoa are motionless, is absolutely devoid of fertilizing power; in the case of such semen, it makes no difference whatever that the external genitals of the man generating it are strongly formed, that his testicles are of normal size, and that erection and ejaculation take place promptly. Of very little value, though not absolutely sterile, is semen containing very few living spermatozoa, or, among very numerous motionless spermatozoa, containing a few only that are engaged in active movement. Suspect, is semen which does not possess the normal light greyish white tint, but is brownish-red, brownish-yellow, yellow, or violet; these variations in colour indicating an admixture with the semen of varying quantities of blood or pus, in consequence of disease of the urethra, the prostate, the seminal vesicles, or some other part of the uropoietic system; such admixtures seriously impair the quality of the semen. An unfavourable judgment must also be passed on semen which, at each successive ejaculation, is voided in very small quantities only — from half a drachm to a drachm. When thus scanty, semen is often found to contain an exceptionally large proportion of dead spermatozoa. We may regard very favourably semen which is voided in quantities considerably in excess of the average; sometimes, when there is a veritable polyspermia, there may be an ounce or upwards, more than three times as much as normal — provided, of course, that this semen so richly voided is of a satisfactory quality, and contains an ample proportion of active spermatozoa. The most valuable characteristic in semen is exhibited when the spermatozoa it contains are not only very numerous and vigorously active, but when they are also very long-lived, when, that is to say, they retain the power of active movement sometimes for as long as three days. A decisive opinion as to the quality of a man's semen can be given only as the result of precise and repeated microscopic examinations, and the medical man must be most careful, when in his first examination he has not been able to detect the presence of any living

spermatozoa, to abstain from giving, on that account alone, an adverse decision — from pronouncing sentence of death on the man's reproductive potency.

It has not hitherto been accurately determined how long spermatozoa can continue to live in the interior of the uterus, although the point is of great importance, not only in relation to conception, but also in regard to the theory of menstruation. *Percy* has published a case in which, eight and a half days after the last coitus, he saw living spermatozoa emerge from the os uteri externum. *Sims* bases upon his own researches the decisive opinion that in the vaginal mucus, spermatozoa can never survive longer than twelve hours, but states that in the mucus of the cervical canal they can live much longer. If thirty-six to forty hours after coitus, we examine the cervical mucus under the microscope, we commonly find living and dead spermatozoa in about equal numbers. Many of the living ones will survive their removal from the cervix for as much as six hours longer.

Of especial interest are the conditions which are liable to deprive a man of the power to produce fertilizing semen. In the first place must be mentioned congenital absence of both testicles — a condition which, in otherwise normally formed male individuals, is one of extreme rarity. Congenital absence of *one* testicle is less rare, and is usually accompanied by absence also of the epididymis, vas deferens, and seminal vesicle of the same side. The *potentia gestandi* of a monorchid depends upon the proper development of his single testicle, and the functional capacity of this organ must be ascertained by a careful microscopic examination of his semen. Much more frequent than absence of the testicle, though still sufficiently rare, is the condition of cryptorchism, non-descent of one or both testicles, a state not necessarily associated with functional incapacity of the organ. Most commonly, however, an undescended testis is an imperfectly developed testis, and in the very great majority of cases the ejaculated fluid contains no spermatozoa.

A further cause of the lack of potent semen is atrophy of the testicles with notable diminution in the size of the glands, and more or less complete disappearance of the seminiferous tubules and their cellular contents. This state is rarely congenital, being nearly always acquired: in consequence of inflammatory conditions affecting the testicle proper or the epididymis (syphilitic inflammation, especially, is apt to lead to overgrowth of the interstitial connective tissue and to gradual destruction by pressure of the seminal tu-

bules)*; or in consequence of the pressure of a hernia, a varicocele, a hydrocele, or a tubercular, carcinomatous, or other new growth; or in consequence of constitutional disorders, especially long-lasting, severe, and exhausting diseases, such as diphtheria, diabetes, or chronic alcoholism; in consequence of diseases affecting that portion of the central nervous system from which the nerves supplying the genital organs arise; in consequence of degenerative changes resulting from sexual excesses; or, finally, in consequence of senile changes, such as fatty changes in the cells of the seminiferous tubules. Certain drugs also, digitalis, salicylic acid, mercury, iodide of potassium, arsenic, and morphine, have an unfavourable influence alike on the quality of the testicular secretion and on the potency of the individual. *Von Gyurkovechky* reports that in Bosnia a plant locally known as "neven" is employed among the peasantry for the temporary suppression of sexual potency, wives giving it to their husbands when the latter are about to leave them and go upon a journey, and sprinkling the leaves of the plant among the underclothing.

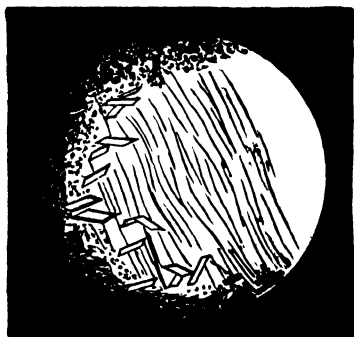


FIG. 63.—Semen consisting chiefly of sperm-crystals, cylindrical spithelium and small granules exhibiting molecular movement—but containing *no* spermatozoa.

By the name of azoöstermia is denoted a condition whose existence can be determined only by microscopic examination.

* The author omits special reference to the metastatic orchitis that so frequently complicates epidemic parotitis (mumps) when that disease occurs after puberty. Though usually benign in character, the inflammation very often results in atrophy of the testicle. Fortunately, bilateral atrophy from this cause is very rare; and even when it does occur, both testicles being extremely small, *potentia cocundi* and *potentia gestandi* may nevertheless remain. But when double atrophy from this cause takes place *before* puberty (happily an occurrence of the utmost rarity), sexual development is usually arrested, the sufferer being in effect a eunuch.—Tr.

The subject of this affection has normal *potentia coeundi*, the semen is ejaculated in quite normal fashion, and it is its constitution only that is faulty. In appearance it is extremely fluid, and is somewhat cloudy; its sediment contains molecular detritus and spermatic crystals, but no spermatozoa (Fig. 63). If the medical man makes it his rule, in all cases in which he is consulted on account of sterility, in deciding how far this sterility is dependent on the condition of the husband, not to confine himself solely to the customary questions, whether intercourse is regularly practised, whether before or after menstruation, etc.—but if in every case he makes a careful examination of the semen under the microscope, he will be astonished to learn the comparative frequency with which he will note the complete or nearly complete absence of spermatozoa. This condition of azoö spermia may be permanent or transitory.

To *Kehrer* belongs the credit of having pointed out that sterility is less often due to impotence or to aspermatism than to azoö spermia—a condition often unsuspected by husband and wife, and one to be diagnosed by the physician only after repeated microscopic examinations of the semen. For this reason, indeed, its existence is often overlooked. *Kehrer* believes himself to be justified in asserting that one-fourth of all cases of sterility (if not indeed more) must be referred to conditions affecting the husband, and most often to azoö spermia; hence he concludes, that the husband must still more often be regarded as the one to blame for the occurrence of sterility, when the cases are borne in mind in which a man marries with an imperfectly healed gonorrhœa, and infects his wife, giving rise to a chronic tubo-uterine blenorrhœa, and ultimately to sealing up of the tubes and to sterility.

Complete absence or marked scarcity of spermatozoa in the semen may occur also without any change in the testicle that can be detected by an external examination, as a consequence of contusions of the testicle, or of gonorrhœal inflammation of the epididymis or vas deferens; further as a sequel of severe general diseases, long-continued physical exertion, or great sexual excess.

In some cases, a microscopical examination reveals, not azoö spermia, but oligozoö spermia, that is to say, the number of living spermatozoa in the semen is remarkably small. Or, again, the anomaly may be of this character that the spermatozoa are smaller than normal, that they are motionless, and that their tails are broken off—such are the peculiarities, as a rule, of the semen of old men.

A less common condition than azoö spermia, but one the pathological importance of which is equally great, is aspermatism, in which the man, neither during coitus, nor in any other form of sexual excitement, is able to ejaculate any semen. This condition may be congenital or acquired; it may be permanent, or transitory (lasting a few weeks or months). In these cases we have to do with organic changes in the testicles, diseases of the prostate, gonorrhœal processes, or nervous disturbances resulting in a loss of irritability in the reflex centre for ejaculation. Aspermatism in the narrower sense of the term, a condition, that is to say, in which there is total suspension of the activity of all the three glands which combine to secrete the composite fluid known as semen, namely, of the testicle, the prostate, and the seminal vesicles—is, according to *Fürbringer*, probably non-existent. The pathological state underlying aspermatism would rather appear to be, not a failure to secrete semen, but a failure to ejaculate it.

Last of all, we have to speak of conception without copulation, of artificial fertilization. In consequence of the mechanical hindrances which in many cases prevent the entrance of the semen into the interior of the uterus, the idea has arisen to introduce the semen by means of instruments directly into the cervical canal, dispensing with the natural act of copulation. Experience long ago gained in

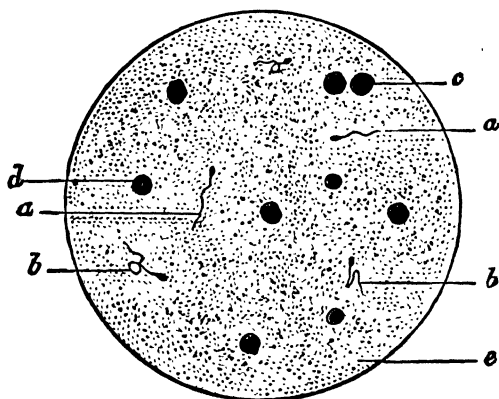


FIG. 64—Oligozoö spermia. a. Living spermatozoa, b. Dead spermatozoa, c. Pus corpuscles, d. Erythrocyte, e. Seminal granules.

artificial pisciculture, no doubt gave rise to this idea. *Spallanzani* and *Rossi* by means of a syringe injected the semen of a dog into the vagina of a bitch, the procedure resulting in impregnation.

Girault appears to have been the first,* in the year 1838, to introduce semen artificially into the human uterus, if we leave out of consideration the experiment of *Léseurs*, who introduced a tampon moistened with semen into the interior of the vagina. The procedure employed by *Girault* is thus described: The patient having been placed in the position usually employed for gynecological examination, a canula resembling a male catheter with the eye in its point, and with a funnel-shaped enlargement at the opposite extremity, is introduced into the uterus, this instrument having first been prepared by moistening its interior with mucilage and filling it with semen; by insufflation, the semen is now expelled into the uterine cavity. It is stated that neither uterine colic nor any other dangerous symptom has ever been brought on by this procedure. The experiments were made at various periods between the year 1838 and the year 1861; they were ten in number, and of these eight proved successful, two unsuccessful. In the ten cases, the total number of insufflations made was twenty-one — the minimum number in any single case being one, the maximum five. In one case, the insufflation was effected immediately after the cessation of menstruation; in the majority, from one to four days after the cessation of menstruation; in one case twelve days, in one case twenty-three days, after the cessation of the flow. *Gautier*, instead of insufflations, has employed injections of semen, using two injections in each case, one just before menstruation was expected, the other a day or two after the cessation of the flow. *Marion Sims* endeavoured in twenty-seven cases to bring about conception by the injection of semen into the uterus; in one of these cases only was the desired result obtained. In this latter instance the patient was twenty-eight years of age, had been married for nine years, but had remained barren. Throughout her menstrual life, she had suffered more or less from dysmenorrhœa, often accompanied by severe constitutional disturbance, such as syncope, vomiting, and headache. Local examination disclosed the existence of retroversion of the uterus with hypertrophy of the posterior wall, an indurated, conical cervix, with stricture of the cervical canal, especially in the region of the os uteri internum. In addition to all these mechanical obstacles to conception, it was found that the semen was never retained in the vagina after coitus. *Sims* examined the patient immediately

*It is recorded of John Hunter that in a case of hypospadias, he advised the patient to draw his semen into a syringe and inject it into his wife's vagina, with fruitful result. TR.

after coitus had taken place, but never found a single drop of semen in the vagina, notwithstanding the fact that this fluid had been ejaculated in abundance. *Sim's* first care was to bring about reposition of the uterus, and to keep the organ in its proper place by the insertion of a suitable pessary. Injections of semen were then undertaken, and were continued throughout a period of nearly twelve months. In two instances, the injection was effected immediately before the onset of the menstrual flow; in eight instances it was effected at varying times (two to seven days) after the cessation of the flow. At first, three drops of semen were injected, but later only half a drop. The semen (first ejaculated into the vagina during normal intercourse) was injected by means of a glass syringe, which was kept in a vessel of warm water at a temperature of 98° F. Since during the removal of the instrument from the water and its insertion into the vagina, some fall in temperature necessarily occurred in the vagina, *Sims* allowed the syringe to remain for some minutes in the vagina before he drew the semen into it, in order that he might feel assured that syringe and vagina had regained the temperature most adapted to the vital activity of the spermatozoa. The nozzle of the syringe was then carefully introduced into the cervical canal, and half a drop of semen was slowly injected into the uterine cavity. For two or three hours after the operation, the patient remained lying quiet in bed. After the tenth experiment, conception ensued—the first recorded case of artificial fertilization in the human species.

With right, however, this case of *Sim's* was not regarded as conclusive, since both before and after the injection, ordinary coitus had been effected, and it is therefore impossible to determine whether the fertilizing spermatozoon was one of those introduced by means of the syringe, or in the antecedent or subsequent coitus—more especially in view of the fact that by the insertion of a pessary *Sims* had, previously to undertaking the injections, restored the uterus to a position more suited to the occurrence of conception in the natural manner.

In a case which *a priori* seemed exceedingly well adapted for the performance of artificial fertilization, one of marked hypospadias in a man whose semen was abundant and contained a large number of vigorously moving spermatozoa, I saw this experiment fail, in spite of all possible care in its performance. In fact, not a single conclusive instance of successful artificial fertilization in the human species is known to me, though I have seen reports of numerous

disagreeable and even dangerous results of attempts to effect it. Both parametritis and perimetritis have occurred in such cases; and semen, being a material in a state of most intense molecular movement, may be regarded as extremely liable to noxious transformations.

Sim's procedure has been modified by other gynecologists. Thus, *Courty's* plan was that during coitus the semen should be collected in a condom, fitting not too closely, from which receptacle it was drawn up into a syringe and carefully injected into the cervical canal. *Pajot's* plan was that the semen should be ejaculated into the vagina in natural coitus, and should thence be pressed into the uterine cavity by means of a piston-like instrument introduced into the vagina.

In London, *Harley* frequently made the experiment of injecting semen into the uterine cavity, but in all cases without any result.

P. Muller, in two cases, on account of extreme ante flexion of the uterus, performed this experiment. Though the general conditions were in both cases extremely favourable, in neither instance was there any result. It must, however, be mentioned that in one of his cases only had there been any preliminary examination of the semen under the microscope.

Fritsch reports a case in which gonorrhœal secretion was injected in place of semen. Peritonitis, which for a month endangered life, was the result.

In Paris, *Lutaud* has earnestly advocated artificial impregnation in cases of sterility in which all other means have failed. It is obvious that it would be useless to employ this measure after the menopause, or in women in whom menstrual activity has ceased prematurely, with simultaneous disappearance of all menstrual molimina. Equally useless would it be in uterine atrophy and in cases of irremediable malformation of the female genitals. Further contra-indications, according to *Lutaud*, are offered by chronic pelvic peritonitis, since here, on account of the obliteration of the lumen of the Fallopian tubes, the operation is foredoomed to failure. Chronic inflammatory states of the uterus and its mucous membrane, will also render the attempt useless. Moreover, it is a condition indispensable to success that the semen to be employed shall have been examined microscopically, and shall have been found to be thoroughly healthy. The operation has the greatest prospect of success when undertaken from three to two days before the due date of menstruation. The method employed is that of *Sims*. If

after the first attempt, the due menstruation should begin, the injection should be repeated a week after the flow has ceased; the attempt should not, however, be repeated more than about six times in all, since the probability of success rapidly diminishes with each successive endeavour. Before the operation is undertaken, the permeability of the cervical canal must be ascertained. Further, in order that the spermatozoa shall be placed in conditions in which they have the best possible chance of survival, a weak alkaline solution, such as 1 per cent. of potassium bicarbonate, should as a preliminary measure be injected into the vagina.

Lutaud thus describes the procedure he employs. Immediately after the woman has had intercourse with her husband, a Ferguson's speculum is introduced into the vagina, the patient remaining in the dorsal decubitus. As the speculum passes in, its margin scrapes the surface of the vagina, and by this means the semen is collected in the vicinity of the cervix. The semen is then drawn up into a Pravaz syringe or an analogous instrument, such as a uterine catheter armed at one end with a rubber ball. The fluid is then carefully injected into the cervical canal, or preferably into the uterine cavity, great care being taken not to injure the mucous membrane in any way, since the slightest bleeding may nullify the whole procedure. Finally, a small tampon of absorbent cotton-wool is inserted into the os uteri externum. For some hours the woman must remain quiet in bed; the tampon is not removed for ten hours. As regards results, *Lutaud* informs us that he has in this way treated twenty-six cases. In twenty-two of these, failure was complete; in one case, success was partial—the patient was impregnated, but abortion occurred two weeks later; in another case, abortion occurred after three months pregnancy; finally, in two cases, success was complete.

Indications for the employment of artificial impregnation are: first, the existence of stenosis in the upper part of the cervical canal, especially stenosis in the upper part of the cervical canal, especially stenosis from flexion, provided, of course, that other measures are contra-indicated or have been fruitlessly employed; secondly, a deleterious character of the secretion of the cervical canal; thirdly, extreme cases of hypospadias in the male. *Haussmann* recommends the employment of artificial impregnation in cases in which the spermatozoa are found to enter the cervical canal, but fail to pass through the os uteri internum. Whilst artificial impregnation is theoretically a sound measure, yet in the practice the indications for

its performance are by no means easy to establish. For, in cases in which there is some mechanical hindrance to the contact of the spermatozoon with the ovum (and it is for such cases only that this method of artificial fertilization can properly be employed), it is often extremely difficult, and may even be quite impossible, to exclude the possibility of there being some failure in ovulation itself, or in the maturation of the ova; or, again, sterility may depend, not on the fact that no ova are fertilized, but on the fact that when fertilized they always fail, for some reason, to find a resting place in the uterus; in a word, in any case in which sterility appears to be due to mechanical obstacles to conception, it may in reality be due to some other disease which has escaped recognition, some organic disease of the uterus, the tubes, the ovaries, of the peritoneal tissues.

Finally, it must be remembered that the manipulation is far from easy in its performance. Above all, the semen must be subjected to a most rigorous microscopical examination in respect of its fertilizing capacity. But this examination cannot be made in the case of the semen that is actually used for the attempt at artificial fertilization; it can only be done with an earlier specimen from the same man. If the semen contains no living spermatozoa, or very few only and these sluggish in their movements, still more if it contains pus corpuscles or gonococci, all idea of its employment for artificial fertilization must be rejected.

The method employed by *Sims*, in which the semen is drawn into a syringe inserted into the vagina post coitum, is one which I am not able to recommend, since in this way together with the semen some vaginal mucus is drawn up, thus, instead of pure semen, we inject into the vagina semen mixed with various impurities, and more especially with an acid secretion known to be unfavourable to the life of the spermatozoa — a circumstance that will doubtless explain many of the failures that have hitherto taken place. It is certainly better that the semen of the husband should be collected in a rubber condom. The preservation of the material to be injected at a suitable temperature (the normal body-temperature), is by no means easy. The syringe, an ordinary Braun's uterine syringe, is first disinfected, and then lies ready in water of the proper temperature. The semen is rapidly drawn up into the syringe, the nozzle of which is then passed down to the fundus uteri. Quite a small quantity of semen will suffice. After the manipulation, which should of course be undertaken at the time most

favourable to conception, just after menstruation, the woman should lie quiet in bed for some hours.

In considering the probability of a successful issue to any such attempt to secure artificial fertilization, we cannot leave out of consideration the likelihood that that result may be prejudiced by the lack of all normal sexual feeling on the part of the wife; concerning the significance of such feeling in relation to the sexual act, we have however as yet no certain knowledge.

That this procedure of artificial fertilization is extremely disagreeable to all concerned therein, the physician not excepted, and that various moral and social considerations can be alleged against it, is incontestable. It is indeed recorded that in Bordeaux a legal penalty was inflicted on a medical man who undertook to bring about artificial fertilization. The Society of Medical Jurists debated this matter, and came to the conclusion that, whilst a medical man was not justified in recommending the practice, neither was he justified in refusing to undertake it when requested by his patients. In Paris, a candidate for the degree of Doctor of Medicine made artificial fecundation the subject of his thesis, and maintained that its practice, when effected with all proper social precautions and according to scientific principles, was possible, reasonable, useful, and moral, and that in many instances it should be recommended by the physician. After a long and stormy debate, the Faculty of Medicine determined to reject the thesis and to destroy all specimens of it already printed, on the ground that "they feared, if they gave their sanction to the practice, that a number of more or less unscrupulous physicians would make that sanction the basis of improper practices, dangerous alike to the family and to the state, since the operative method under consideration was one likely to be eagerly exploited by the whole tribe of medical charlatans." This weighty pronouncement would appear to be sufficient ground for rejecting artificial fecundation as a matter of routine practice; still, very exceptional cases may be encountered in which it may be seized as an ultimum refugium.

Pathology of Copulation.

The act of copulation may be interfered with or entirely prevented by pathological conditions affecting the genital canal of the woman, and also by disturbances of the nervous system — naturally also by any abnormality affecting the performance of the male partner in the act.

Abnormality of the hymer, such as excessive strength and rigidity, rendering the organ unduly persistent, is a not infrequent hindrance to intercourse, one that sometimes is not overcome even after years of married life; to such a state of affairs ignorance on the part of the married pair in respect to the proper method of intercourse, lack of sufficient sexual power on the part of the male, or inflammation of the fossa navicularis brought on by maladroit attempts at penetration, may contribute, likewise undue passivity on the part of the female partner.

A notable and sometimes an insuperable obstacle (of which it has been written, *nec Hannibal quidem has portas perfringere valuisse*) is constituted by that abnormality of the hymen in which the aperture in that membrane is guarded by a sagittally placed or sometimes oblique septum, dense and almost tendinous in structure. In a woman of twenty-four years, who for two years had lived in sterile wedlock, I found such a tendinous hymen septum. She had menstruated regularly since the age of seventeen years, but always painfully. She complained that her husband was "very weak," inasmuch as on her bridal night he was unable to succeed in completing intercourse, and since then whenever he attempted intercourse, premature ejaculation resulted, before penetration of the penis

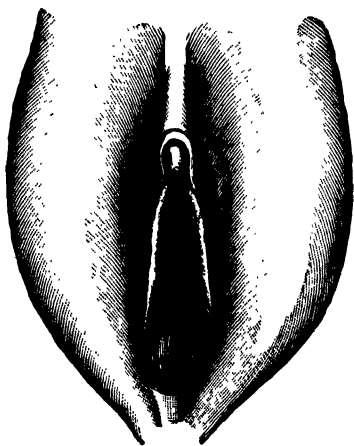


FIG. 65.—Septate Hymen, the septum having a tendinous consistency.

had been effected. In consequence of this repeated ineffectual sexual excitement, she had herself become very nervous. On local examination, I found an elongated oval hymen, not com-

pletely covering the vaginal orifice, rather strong and thick, and divided in two halves by a median sagittal septum, of a densely tendinous consistency. On either side of the septum, the vaginal orifice would admit no more than the head of an ordinary uterine sound. I divided this septum, and was informed later that the woman had become pregnant as a result of the first subsequent act of intercourse (Fig. 65).

A remarkable case of abnormality of the hymen is recorded by *Heitzmann*, having been observed by him in a woman aged twenty-seven years. In this instance, the hymen was represented by a swelling, smooth on the surface and separated from the nymphæ by a deep furrow. Behind this swelling, between it and the posterior commissure, there was a deep depression, into which the finger could be passed to a depth of an inch and a half or more. Anteriorly, the very firm and fleshy prominence was bounded by a ridge, from the middle of which to the urethral orifice ran a short but strong and tense septum. Right and left of this septum were small apertures, with difficulty admitting the point of a probe. Between the anterior extremity of the septum and the urethral orifice was a nodular representative of the swelling normally present in this situation. Surrounding the urethral orifice were two or three additional small nodules. The two lateral margins of the hymen were prolonged around the urethral orifice, and united in front thereof to form a raphe, which could be traced as far as the base of the clitoris. The young woman had been married for some months, and asserted that she had repeatedly had intercourse. With such a condition of the female genitals, penetration of the penis into the vagina was however quite impossible. During coitus, the penis must have been inserted into the aforesaid depression behind the swelling, which was sufficiently extensible for the purpose.

A less serious hindrance to intercourse, but one more frequently encountered, is a partial persistence of the septum of the hymeneal orifice, in such a manner that there is a projecting tongue of membrane from the anterior and posterior margins of the orifice, partially blocking this latter; or there may be a single median projection only, either in front or behind. Such processes may be remarkable alike for their size and their shape. *Liman* describes a cordiform hymeneal orifice, constituted by an anterior or posterior protection of the kind here described.

In cases of imperforate hymen in which the occlusion of the vagina is not complete, impregnation may in rare instances occur,

even though proper intromission of the penis is quite impossible. Cases of this kind have been observed by *Scanzoni*, *Horton*, *K. Braun*, *Leopold*, *Brille*, *Breisky*, and others.

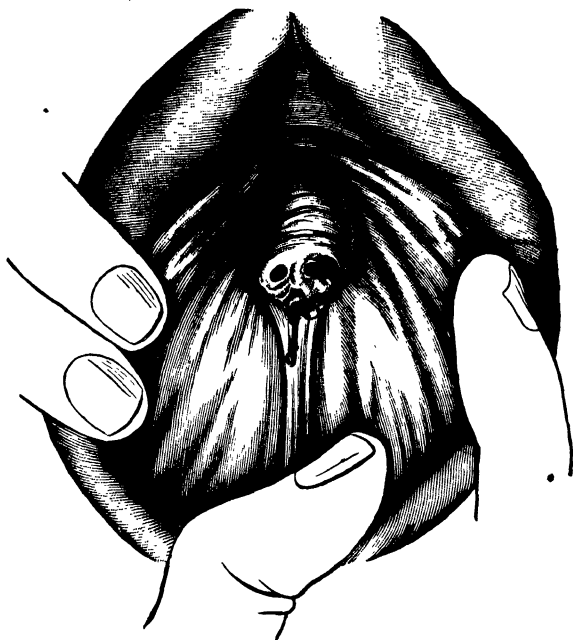


FIG. 66.

In most of these cases there was a thick, dense, "imperforate," or rather *persistent* hymen, with an orifice no larger than the head of an ordinary probe, notwithstanding which pregnancy had occurred. The cases reported by *Brill* were of a different character, being those of two young unmarried Russian girls, with normal undestroyed hymens, who were found to be pregnant. According to *Brill*, such cases are by no means uncommon among the peasantry of Little Russia, where the barbarous practice prevails of adolescent girls and boys sleeping together. In these circumstances, sexual intercourse takes place, but, from fear of consequences, it is often incomplete. Hence, in occasional cases, results pregnancy in a young girl with intact hymen.

In the first complete act of intercourse, the defloration of the virgin, the hymen is as a rule torn in several directions, and in consequence there is usually moderate bleeding. The lacerations of

the hymen soon skin over. When the initial coitus is effected *mala-droitly* or roughly, more extensive lacerations are apt to occur, and the injury may not be limited to the hymen, but may extend longitudinally along the vaginal wall, and even involve the posterior vaginal fornix. Or, again, without any such extensive laceration, there may result very profuse bleeding, in consequence of abnormally profuse vascularization of the hymen. Cases are also recorded in which (presumably not from normal coitus alone, but from other, unacknowledged manipulations), whilst the hymen has been left intact, false passages have been made, leading to the formation of fistulae, with subsequent death from haemorrhage or sepsis.

Apart from impotence in the male, the hymen may remain intact when it is not touched at all during coitus. Inexperience, as *Veit* remarks, will in this matter lead to results almost incredible. This author has been informed by such inexperienced married couples, that in attempts at intercourse "the penis of the man is introduced between the thighs of the woman, which are closely pressed together, the man having his legs on either side. Naturally, in this method of intercourse, the hymen escapes destruction. In such attempts at coitus, things are done which can hardly be compared with the normal act of copulation."

In isolated instances, the introduction of the penis is prevented by congenital or acquired defects in the formation of the external genitals. Adhesion between the labia majora and the labia minora is sometimes met with a congenital deformity, which may or may not be associated with atresia of the urethral orifice; in some cases the adhesion is dependent merely upon a superficial epithelial continuity, but in others the labia are firmly adherent throughout. Less rare are acquired adhesions, the result of accident, between the labia majora and the labia minora, leading to atresia of the vulva, and thus making copulation impossible.

Intromission of the penis may be rendered quite impossible by excessive size of the labia majora, consequent upon elephantiasis, in which disease there is enormous hypertrophy of the subcutaneous connective tissue. New growths may have the same result, fibroids, for instance, lipomata, and cysts, which may attain a remarkable size in the cellular tissue of the labia, the mons veneris, and the perineum, and also in the nymphae and in the cellular tissue between the clitoris and the urethral orifice. In a very obese woman twenty-eight years of age I saw a lipoma attached to the right

labium majus. In the course of six years it had grown to such an enormous size, that it extended downwards over the thigh, blocked the entrance to the vagina, and made coitus absolutely impossible

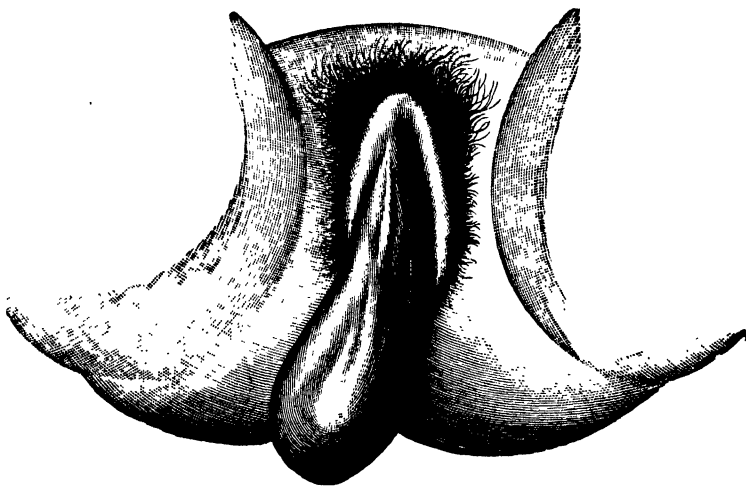


FIG. 67.—Lipoma of the right labium majus, occluding the vaginal inlet.

(Fig. 67). Various forms of labial hernia are also competent to occlude the vaginal orifice.

Hypertrophy of the nymphae, which, as the so-called *Hottentot Apron* has to be regarded as a racial peculiarity, is known also in Europe as a pathological condition which may at times constitute a hindrance to sexual intercourse (Fig. 68). According to *Otto* there are three fundamental forms of the Hottentot apron, viz., excessive enlargement of the nymphae, overgrowth of the labia majora, and, lastly, the formation of a peculiar lobe of flesh and skin, attached to the mons veneris by a pedicle, containing the clitoris, and covering the genital fissure as with a valve. Hypertrophy of the nymphae is said to be common also in Turkish and in Persian women. Owing to the obstacle to intercourse presented by hypertrophied nymphae, it is among certain races an established custom to amputate clitoris and nymphae together. *Virey* writes: "The Portuguese Jesuit missionaries to Abyssinia in the sixteenth century, endeavoured to abolish this practice of the circumcision of women, which they regarded as a relic of Mohammedanism; the uncircumcised maidens, however, could find no husbands, owing to the inconvenient length of their nymphae. The pope sent surgeons

to the country, to enquire into the matter, and their reports were in such sense that circumcision was permitted as necessary." Davis reports observations made by Sonini on the female indigens of

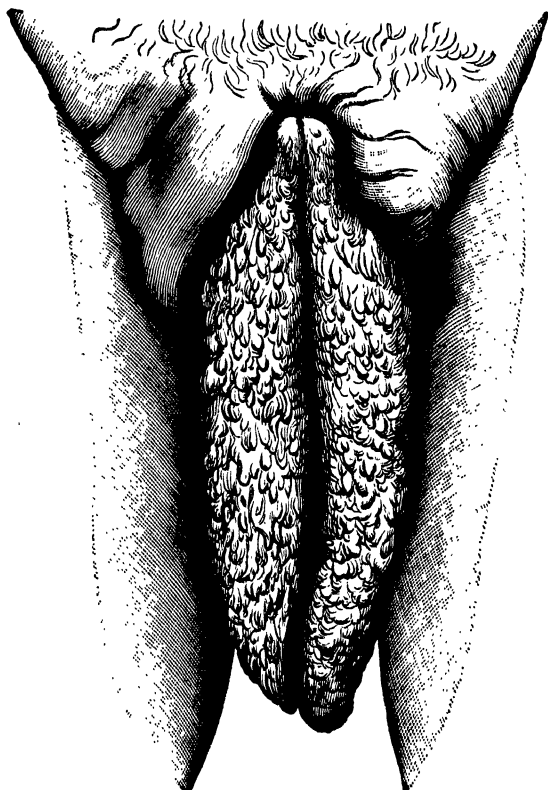


FIG. 68.—"Hottentot apron" in an adult woman, hanging down between the thighs. (After Zweifel.)

lower Egypt, in whom the vulva hangs down in the form of a loose, flabby mass of flesh, of striking length and thickness, completely covering the genital fissure. He believes that the circumcision that was practised on the women of ancient Egypt consisted in the removal of this hypertrophied vulva.

Courty saw a case in which the remarkable length of the labia minora, which when an attempt was made to introduce the penis, covered the vaginal orifice, had rendered coitus ineffective, and had

caused sterility for five years. Resection of the labia minora was followed by successful intercourse and conception.

The lipomatous form, especially, of elephantiasis vulvae often attains a gigantic size. Growths of this nature, of the size of a child's head, weighing six or seven kilo (thirteen to fifteen pounds), and reaching down to below the knee, are by no means rare. I have known several cases in which an excessive accumulation of fat in the vulva associated with pendulous belly has constituted a mechanical obstacle to the completion of sexual intercourse.

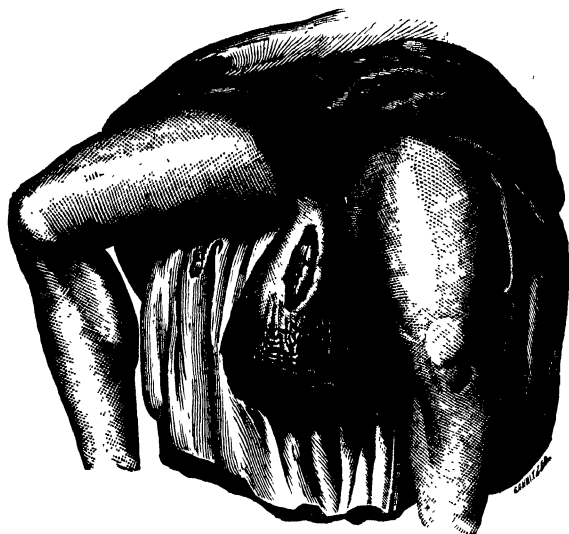


FIG. 69.—Elephantiasis of the labia majora

Hypertrophy of the clitoris may constitute an obstacle to coitus. In exceptional cases, this organ is as large as the male penis, and hangs down over the genital fissure like a valve. *Hyrtl* relates that in certain African races, this congenital enlargement of the clitoris is so enormous, that the organ, made fast to the perineum with rings, serves for the protection of virginity. *Schönfeld* describes the case of a woman aged twenty-eight years, in whom the vaginal orifice was almost completely occluded by a dry and firm growth, with a granulated surface. Close observation proved this growth to be produced by a hypertrophied and degenerated clitoris, which had attained the size of a child's head. Elephantiasis of the clitoris

is especially inconvenient in consequence of the hindrance which the enlarged organ offers to sexual intercourse. *Bainbridge* describes a case of tumour of the clitoris measuring 8 cm. (3.2 in.) in length and 5 cm. (2 in.) in width. The following remarkable case is recorded by *Oesterlen*: A young man wished to break off his engagement on the ground that his intended wife was a hermaphrodite. Examination, however, disclosed the existence of a strong intact hymen, a very large clitoris, and pregnancy of the twentieth week.

Injuries of the vagina resulting from coitus are, generally speaking, rare. The usual cause of such injuries is disproportion in size between the erect penis and the calibre of the vagina, or else brutal violence in the performance of coitus; sometimes, however, it is dependent on the pathological state of the female genital organs, which have undergone senile atrophy.

To the first group belongs the case reported by *Albert*, in which a girl of eleven years was found to have a laceration of the vagina communicating with the peritoneal cavity, the injury resulting from coitus. To the second group belongs the case reported by *Böhm*, of lacerations of the vaginal mucous membrane resulting from forcible coitus in elderly women. *E. Frank* reports a case of injury due to violent coitus in a woman in whom the vagina was already greatly stretched by retroflexion; and another case in which injury occurred during intercourse in a woman with vagina duplex—in this case, not only was the hymen of the right vagina torn, but also the septum between the two vaginæ.

By no means extremely rare are injuries to the vagina in the act of defloration, causing severe hemorrhage. *Martin* records a fatal case of this nature. *Maschka* and *Hofmann*, the authorities on Forensic Medicine, deny that vaginal laceration is the result of simple coitus, and *Hofmann* maintains that such serious injury can occur only from digital manipulations; in fact, these writers believe that the penis alone cannot be employed with sufficient force to cause laceration. *Barthel* and *Anderson*, however, saw vaginal lacerations in nulliparous women; and *Zeis* records a case of vaginal laceration in a woman twenty-five years of age, with whom, six weeks after parturition, her husband, then in a state of intoxication, had had intercourse in the position *à la vache*.

Anomalies of the vagina, absence, stricture, duplication, and abnormal apertures, also diseases of the vaginal tissues, may induce incapacity for sexual intercourse. In frequency as in significance, among these disorders, absence of the vagina and stenosis and atresia

of the canal, stand in the first rank. Congenital atresia may be complete or only partial, according as the two ducts of *Müller* from the fusion of which the tube is formed, remain totally or only partially solid — or, having duly canalized, subsequently, by a foetal inflammatory process, become transformed into a thick, more or less solid cord. If the obliteration of the vagina is at the lower extremity of the canal, coitus is impossible, unless, as sometimes happens, by frequent attempts at intercourse, the short blind sac representing the lower end of the vagina has been stretched upwards in the form of a pouch. When the obliteration of the ducts of *Müller* is complete, we have total atresia of the vagina, in which case the uterus is also as a rule wanting, or is but imperfectly represented. In some cases, from the ducts of *Müller*, instead of the normal vagina, there is formed a tract of membrane of varying density and width, through which passes a small canal for the passage of the menstrual discharge; this condition is known as atresia vaginalis membranacea.

When, notwithstanding malformation of the external genital organs and partial absence of the vagina, there is no defect in the internal genital organs, conceptions may sometimes be effected through some abnormal channel, as for instance through a communication established per anum; or, again, some operative procedure may bring relief. *Rossi* reports a case of congenital absence of the external genital organs, in which an incision was made in the region of the absent vagina, and an artificial vagina was thus constructed; copulation was in this way rendered possible, and conception ensued. In this connection, we may turn with interest to the essay by *Louis*, entitled *Deficiente Vagina, Possuntne per Rectum Concipere Mulieres?* Here we are told of a case in which vulva and vagina were absent, and there was a monthly discharge of blood per anum; the woman's lover employed this passage also *ad immissionem penis*, and the woman became pregnant. Pope Benedict XIV expressly allowed to women suffering from *imperforatio vaginae* the practice of *coitus parte posteriori*.

Further, in cases of atresia vaginae in which the genital canal terminates in the urethra, conception can result from urethral coitus, as is proved by cases recorded by *K. von Braun*, *Weinbaum*, and *Wyder*. In *Weinbaum's* case, the obliteration of the vagina was complete, neither eye nor finger could detect the slightest aperture; the woman having become pregnant after *coitus per urethram*, delivery was effected by Caesarian section. In *Wyder's* case, the vaginal orifice was closed, with the exception of a minute aperture, by

means of dense fibrous tissue; the woman was in labour and the head of the child was in the pelvis. Under anaesthesia, the septum, which was nearly an inch thick, was divided, the opening was enlarged, and the child was extracted by forceps. An investigation disclosed that the husband had always had intercourse by introducing his penis into the dilated urethra; it was evident that the semen had passed through the urethra into the bladder, and thence had found its way through a vesico-vaginal fistula into the vagina and uterus.

Acquired obliteration and stricture of the vagina from the contraction of scar tissue, in consequence of deep ulceration, especially when croupous or diphtheritic in nature, following typhus or typhoid, pyaemia, puerperal sepsis, and the acute exanthemata (especially variola) — may likewise serve as obstacles to coitus. Syphilitic affections also, through contraction of exudations, the adhesion of ulcerated opposing surfaces, condylomata, etc., may give rise to stricture or obliteration of the vagina. The same conditions may be induced by trauma, as by wounds, by attempts at rape, or by the use of caustic acids and alkalis.

Thus, *Ahlfeld* saw severe stricture of the vagina as a sequel of the excision of four large condylomata. *Hennig* the same, after variola, and again in lunatics who had introduced caustic fluids into the vagina. By *L. Mayer*, atresia vaginae was seen as a sequel of typhoid; by *Weiss* as a sequel of diphtheria; by *Martin* from the action of irritant secretions in cases of uterine tumour; by *Billroth* as a result of continued irrigation of the vagina with alkaline urine after lithotomy or urethrotomy, and in cases of vesico-vaginal fistula. Ulcerative processes set up by the long continued action of a vaginal tampon, a pessary, or some other foreign body, have been noted as leading to consecutive obliteration of the vagina.

Such stenosis, when partial only, may prevent complete coitus, and yet allow conception to occur. Cases illustrating this fact have been numerous recorded. Thus, *van Swieten* already reported the case of a girl aged sixteen years, whose vagina was strictured to such an extent that the passage would barely admit a crow-quill; nevertheless she became pregnant, and was successfully delivered. Similar cases are mentioned by *von Scanzoni*, *Kennedy*, *Devilliers*, *Varge*, *Moreau*, and *Plenk*.

Serious obstacles to coitus, of a nature analogous to acquired stenosis of the vagina, are constituted by the irregular ligamentous bridges which sometimes arise in the vagina from the adhesion of a

strip torn from the mucous membrane on one side of the vagina to the other side of that tube — or, again, a portion of a lacerated cervix may adhere to the wall of the vagina. An interesting case of this nature came under my own observation. It was a woman aged thirty-two years, who had twice had difficult deliveries, the last time nine years before. Since then she had been barren. On local examination I found in the vagina a fleshy bridge, about 4 cm. (1.6 in.) wide and 6 cm. (2.4 in.) long, extending from the left side of the portio vaginalis to the right wall of the vagina; this mass of tissue was so placed that the intromitted penis must necessarily have slipped past it into a blind sac, such as the French name *une poche copulatrice*. Similar membranes in the vagina have been described by *Breisky*, *Murphy*, and *Thomson*.

Various tumours may narrow or even completely close the vaginal passage, myoma, sarcoma, carcinoma, and especially the polypoid form of fibro-myoma, which may even project without the vaginal orifice. And even when tumours of or in the vagina do not actually hinder coitus by the space they occupy, they may affect that operation by bleeding whenever it is undertaken, a manifestation extremely alarming to young married persons.

The vagina may also be partially occupied, and coitus may be impeded, by elongation of the hypertrophied cervix uteri, by inversion or prolapse of the uterus, by cystocele or rectocele, and by uterine polypi. *Hörwitz* records the case of a woman aged twenty-two years in whom *impotentia coeundi* was dependent upon the occlusion of the vaginal orifice by a rounded, strongly projecting body, which proved on closer examination to be a hypertrophied vaginal bulb.

Tumours of the rectum and other intra-pelvic growths may encroach upon the vaginal passage and impede coitus. Closure of the vagina has been brought about even by abnormal size and abnormal toughness of the perineum.

Finally, in extreme degrees of pelvic contraction, the vagina may be so much narrowed as to interfere with coitus. *Von Hofmann* records a case of this nature: In a woman thirty years of age, affected with kypho-scoliosis, who suffered extreme pain whenever her husband attempted sexual intercourse, the pelvis was twisted and narrowed to such an extent that the conjugate measured barely one inch, and the vagina was so small as barely to admit the finger.

Duplication of the vagina will constitute an obstacle to coitus when both halves of the passage are too narrow to allow of intro-

mission of the penis. Difficulty in intercourse will also be caused by abnormal termination of the vagina, as by its termination in the rectum, likewise by severe perineal laceration which has converted the lower parts of the vagina and rectum into a cloaca, likewise by recto-vaginal and vesico-vaginal fistulae; in the case of all these latter states a feeling of disgust is apt to be aroused in the male which may effectually check sexual desire. Still, coitus, and even conception, are quite possible in these conditions. *Kroner*, among sixty cases of vaginal fistula, observed six in which conception took place while the fistula was actually open.

Apart from all local pathological conditions, coitus may be interfered with by general nervous disturbances, manifesting themselves locally, and depriving the woman so affected of *potentia coeundi*. First among such states must be mentioned *vaginismus*, a condition so important as to demand discussion in a separate chapter.

An important and by no means rare obstacle to the completion of intercourse, affecting the male partner in the act, is partial or complete incapacity for erection of the penis. Even excessive smallness of the penis may render coitus inadequate; still more so, however, organic diseases of the membrum, such as obliteration of the corpora cavernosa, or of some of the trabecular channels of these bodies, nodular formations resulting from injury, or cavernitis from gonorrhoea. In such cases, erection is extremely irregular, and the erect penis is sharply bent (*chordee*) instead of being straight, a condition which renders intromission mechanically difficult if not impossible. A similar effect is produced by ossification of some part of the tunica albuginea of the corpora cavernosa—the so-called penis bone. Mechanical obstacles to coitus are also offered by inguinal and scrotal hernias; and by excessive obesity, where the increase in thickness of the panniculus adiposus of the abdominal wall and the mons pubis, whilst the penis itself remains as slender as before, causes the organ almost to disappear from view.

Psychical impotence in the male is much more frequently observed than organic impotence. We meet with this condition especially in neurasthenically predisposed individuals, or in men who have been given to excessive venery or have masturbated excessively in youth, and who, when entering upon married life, fear they will be unable to satisfy the legitimate desires of their wives; or in newly married men who have suffered often from gonorrhoeal inflammations, such as prostatitis, vesical catarrh, and epididymitis. The fear and anxiety from which such persons suffer has an inhibitory influence upon

the erection of the penis. In some instances, this inhibitory influence is partial only, and the man thus affected, while perfectly competent in intercourse with a prostitute, who employs means of sexual stimulation to which he has become accustomed, is unable to complete intercourse with his wife, who is ignorant and innocent, and assumes a purely passive rôle; or it may be that erection is not sufficiently powerful to bring about rupture of the hymen, and thus to overcome the difficulties *primae noctis*.

As regards gonorrhoeal infection, it appears that in men who in other respects are perfectly competent, this disease has an inhibitory influence upon the nervous mechanism concerned in producing erection of the penis.

Psychical impotence is usually transitory, but it may endure for a very long time; and it may be many months before the husband, whose nervousness has led to failure in the decisive moment at the outset of married life, is able to command an erection sufficiently powerful to bring about the defloration of his wife. Occasionally such psychical impotence is not absolute but relative, it relates, that is to say, to one particular woman—unfortunately, as a rule, a man's own lawful wife,—whilst coitus with another woman, even in default of any measures for artificial sexual stimulation, is easily effected. This fatal misfortune is especially liable to occur in cases in which a man fully experienced in sexual matters marries a woman whom he dislikes or for whom he has no regard, the marriage being determined by material considerations. From such women I have heard the painful confession that the husband, a man renowned for his gallantries, played a very poor part in the bridal bed.

The impotence of *irritable weakness* is characterized by premature, and therefore fruitless ejaculation. A man thus affected has a powerful erection of the penis, preparatory to coitus, but at the moment of contact with the female genital organs, before there has been time for penetration to occur, ejaculation takes place, and is immediately followed by relaxation of the penis. Such irritative impotence is often met with in young men at the outset of their sexual career, in beginners, whose sexual passion is very readily excited, whose imagination shoots forward to the goal, and who are unable to restrain themselves. This form of impotence can also be cured by wisely chosen measures.

The *paralytic* form of impotence, on the other hand, is characterized by the entire absence of erections of the penis, both overnight in bed, and during the early morning hours; the penis always re-

mains flaccid, or at most becomes semi-erect only, insufficiently rigid for penetration. Ejaculation is much retarded or altogether wanting.

Impotentia coeundi in the male may be *complete*, in cases in which the erection-apparatus is entirely inactive, and in which even an attempt at intercourse is out of the question; or, and this is more frequently met with, it may be partial only, and manifests itself in various degrees of imperfection in the performance of coitus.

This latter form may often escape the woman's notice. Whilst complete impotentia coeundi, in which intromission of the penis is impossible, is a state about which neither husband and wife can fail to be fully informed, cases of partial impotence, with semi-erection of the penis or premature ejaculation, are often glozed over by the husband, ignored by the wife, and underestimated by the physician—and yet such incomplete intercourse entails a series of ill-consequences alike upon the genital organs and upon the nervous system of the wife. Erection is incomplete, and thus the penis passes into the vestibule only, and not deep into the vagina; even if penetration is more thorough, the venous return of the blood from the corpora cavernosa is not checked sufficiently to distend the penis to its full size, and to bring it into close contact with the vaginal walls; or ejaculation occurs prematurely, before the sexual organism of the wife has attained that supreme degree which is needful alike for the attainment of sexual gratification and for the occurrence of conception.

Vaginismus.

Vaginismus is a disordered state, characterized by hyperaesthesia of the hymen and of the entrance to the vagina, so extreme that, even though the organs may be entirely free from any anatomical abnormality, coitus is prevented, whenever attempted, by violent, involuntary spasmodic contractions of the constrictor cunni and the other muscles of the urogenital and anal region.

The centripetal paths of the reflex spasm characteristic of vaginismus, run through the branches of the inferior hypogastric plexus, and especially through the utero-vaginal plexus. The spinal nerves connected with this part of the sympathetic are the 2d, 3d, and 4th sacral. The plexuses are constituted by fibres in part from sympathetic and in part from the 2d, 3d, and 4th sacral nerves. Through the same nerves passes the centripetal motor tract

for the transversus perinei muscle, and for the sphincter and levator ani muscles. According to *Eulenburg*, the centre for this reflex is to be found at the level of the first sacral nerve; when the disturbance irradiates more widely, the lumbar and sacral plexuses as a whole are involved. The constrictor cunni (sphincter vaginæ or bulbo-cavernosus muscle) is supplied by the perineal branch of the pudic nerve. The symptom-complex of vaginismus consists of violent spastic contraction, for a term varying greatly in duration, of the constrictor cunni (bulbo-cavernosus), sphincter ani, levator ani, and transversus perinei muscles, the spasm spreading, in severe cases, to other muscles in the neighbourhood, and especially to the adductor muscles of the thigh; the spasm comes on when any attempt at intercourse is made, and even when the genitals are merely touched.

In young married couples especially, vaginismus is an extremely distressing condition, and one that entails very serious consequences, inasmuch as the pains and reflex spasms which result from any attempt at coitus, and even from the mere approximation of the penis to the female genital organs, render sexual intercourse absolutely impossible. The cause of this pathological manifestation is in part to be found in unskilful attempts at intercourse, which have stimulated the female genital organs at some improper region. It may be that the young husband is not fully instructed in sexual matters, and does not really know how coitus ought to be effected; in other cases there is some abnormality of the hymen, which has rendered the rupture of that membrane extremely difficult; in some cases there is partial impotence in the male, whose penis becomes semi-erect only, so that ever renewed attempts at intercourse are followed by ever-renewed failure. Any of these causes may suffice, in susceptible women, to originate vaginismus. The sufferer in these cases will usually be found on enquiry to be hereditarily predisposed to nervous disorder, and to be extremely sensitive to pain. By the fruitless efforts of her ignorant or partially impotent husband, she is sensually excited without ever being satisfied; the injured nervous system responds by these local spasms, whilst ultimately, in some of these cases, an actual psychosis ensues.

In a certain number of cases, however, the husband is in no way responsible for the origin of vaginismus, which may depend on pathological states of the female external genitals, leading to hyperaesthesia; or, again, on primary hyperaesthesia of the pudic nerve and its branches; or, finally, on general neurasthenia and

hysteria, on excessive sensibility and lack of self-control on the part of a young girl, who has entered upon married life under the dominion of extravagant ideas. Vaginismus dependent upon general neurasthenia especially in cases in which there is no strong affection for the husband to give the spur to desire, and to enable the woman to bear with fortitude the pangs which form the necessary introduction to the joys of wedded life. It must not be forgotten, as throwing light on the origin of vaginismus, that in the digital vaginal examination of a virgin or even of a young wife, unless extreme care is taken, pain and painful muscular spasms are liable to be evoked.

The local pathological conditions of the female genital organs that are most often met with in cases of vaginismus are: a very rigid state of the hymen; inflammation and excoriation of the hymen and its surroundings; fissures at the vaginal orifice; inflammatory affections of the vaginal follicles; inflammation of the carunculae myrtiformes; a peculiar formation of the vulva, which extends forwards over the pubic symphysis, whereby the urethral orifice and the hymenal aperture come to lie upon the pubic symphysis or the subpubic ligament; vulvitis; herpes or eczema of the vulva; colpitis; urethritis; fissure of the anus; papillary growths; pruritus papules; urethral caruncle; inflammation of Bartholin's glands; at times gonorrhoeal infection.

A case came under my own observation in which a newly married woman suffered from vaginismus. The husband believed the cause of the trouble was his own partial impotence, consequent upon youthful venereal excesses, and yielded to the desire of his wife and her relatives that a divorce should be obtained. A year later, the woman remarried, when, to her horror, the symptoms returned in full force. Now for the first time she consulted me, and on local examination I could detect no abnormality whatever. The vaginismus was in this instance a pure neurosis, the only possible cause of which was to be found in bygone overstimulation of the vaginal orifice, the wife admitting previous onanistic excesses. In another case known to me, vaginismus in the wife made the husband an involuntary sodomite. The movements of the wife when the spasm came on led to the introduction of the penis per anum, and coitus had repeatedly been effected by this abnormal route, when the fact first became apparent as the result of a local examination.

Le Fort reports the case of a young Russian wedded pair who

were spending their honeymoon in Paris. The husband took so much to heart his inability to fulfil his marital obligations in consequence of the vaginismus from which his wife suffered, that he shot himself through the heart. The distressing situation of a husband whose wife suffers from vaginismus, rendering coitus impossible, is depicted in the well-known French romance, "*Mademoiselle Giraud, Ma Femme.*" From a false shame, women often continue to suffer from vaginismus for months and even years, without a single effective coitus having ever taken place; it is only the consequent sterility which at last leads to medical advice being sought. The physician then usually ascertains that the hymen is still intact, or at least incompletely destroyed, that on this membrane and on various parts of the vulva there are erosions, and that the whole of the external genitals outside the hymen are in a state of inflammation more or less acute. In other cases, however, neither excoriations, erosions, nor inflammation can be detected, and the existence of vaginismus can be proved only by the pain and the muscular spasm set up by contact with the vagina. Often, indeed, the cause of this most distressing affection cannot be discovered.

Introduction of the penis may be rendered impossible by spasm of the constrictor cunni (bulbo-cavernosus) muscle, but equally so by spasm of the transversus perinei or the levator ani muscle. Sometimes the spasm affects all three muscular groups, in which case the narrowing of the vagina is extreme, and extends for some way up into the canal. When the levator ani alone is affected by the spasm, the penis can, indeed, be introduced into the vagina, to encounter a powerful obstacle in the interior of that canal; and it may happen, when the spasm comes on and affects the levator ani only after complete intromission of the penis, that the penis is retained in the vaginal fornix by the active contraction of the pelvic floor.

More or less credible instances of *penis captivus* thus ^{produced} about are on record. The following history is by Davis: A gentleman entering his stable found therein his coachman and a servant-maid in a most compromising position. All endeavours of the pair thus surprised to separate proved ineffectual, and their attempts to draw apart caused them intense pain. Davis was sent for, and ordered an iced douche, which, however, failed to liberate the imprisoned penis. Release was impossible until the woman had been placed under chloroform. The swollen and livid penis exhibited

two strangulation-furrows, a proof that two distinct areas of the levator ani muscle had been spasmodically contracted.

Hildebrand records three cases observed by himself in which there was spasm of the upper part only of the vagina, unaccompanied by vaginismus (*i. e.*, by pain). In two of these cases, the spasm was originated by the contact of the examining finger with very painful ulcers of the portio vaginalis; the third patient had a very sensitive prolapsed ovary. *Fritsch* reports having had on one occasion to give a woman chloroform for the release of a swollen and imprisoned penis.

Hildebrand suggests that vaginismus may be caused by an abnormal size of the penis, or by a condition occurring in weaklings and alcoholic subjects, in whom the greatest swellings of the glans penis occurs before intromission, whilst this greatest swelling is normally deferred until towards the end of the act, when the glans is in the vaginal fornix.

Schröder writes as follows regarding the etiology of vaginismus: "The affection is dependent upon trauma, sustained in maladroitness, frequently repeated attempts at sexual intercourse; for this reason it is met with, in the great majority of cases in young, newly married women. Impotence in the male is by no means necessary for its production, and such impotence is not even a frequent antecedent. Abnormal narrowness of the vagina, or extreme firmness of the hymen, is occasionally found, but neither is in any way necessary; all that can be said in this connection of a small vaginal orifice is, that it *predisposes* to vaginismus. If the husband is devoid of previous experience in sexual matters, maladroitness attempts at intercourse are exceedingly likely to occur. The penis is thrust in the wrong direction, pressing against either the anterior or the posterior commissure of the vulva. Very often, moreover, the position of the vulva, which is subject to very striking individual variations, is concerned in the production of vaginismus. There are many women in whom the vulva lies in part in front of the symphysis pubis, so that the lower border of the symphysis lies below the urethral orifice. In such cases the penis is directed too far backwards, and instead of passing into the vaginal orifice, slips into the fossa navicularis. The frequent repetition of such maladroitness attempts at intercourse gives rise to a gradually increasing sensitiveness of the parts concerned, with the formation of excoriations. It now results that, on the one hand, the woman dreads attempts at intercourse on account of the pain to which they give rise; she shrinks away

from the man, so that penetration of the vagina by the penis is rendered even more difficult than it was before; and, on the other hand, ungratified sexual desire leads to the frequent repetition of attempts at complete intercourse (from which, moreover, if conception should ensue, a cure of the trouble is expected). In this way, the trauma is rendered more severe, the congestion and excoriation of the fossa navicularis or of the urethral region are aggravated, and the sensitiveness of the parts increases to such a degree that the woman thus affected screams out when the vulva is merely touched. Ultimately reflex cramps set in whenever intercourse is attempted, and we then have the fully developed clinical picture of vaginismus."

Winckel maintains that in most cases there are two principal elements in the causation of vaginismus. In the first place, in consequence of more or less pronounced anatomical changes, there is undue sensitiveness and tenderness of the vaginal inlet and its neighbourhood, and in exceptional cases also of the upper part of the vagina, the uterus, and the ovaries. In the second place, the patient manifests an increased general sensitiveness and nervous irritability; this is in some cases primary, but in others it is entirely the result of the repeated stimulation; and in either case it is heightened by the effects of ungratified sexual desire.

A. Martin points out that the spasm of the muscles of the pelvic floor, and especially of the levator ani muscle, upon which vaginismus depends, may be due in some cases to the influence of chill, since the same cause will lead to pathological contractions in other muscular areas. But in such cases it is always open to question if masturbation or some other sexual perversion is not the true cause of the disorder. In some instances vaginismus is merely a symptom, in extremely sensitive women, of various diseases of the reproductive organs, and is brought on by the increased pain which in such cases is caused by attempts at intercourse; when produced in this way, vaginismus is usually a transient manifestation.

Veit considers that among the pathological conditions giving rise to vaginismus, we must also enumerate diseases of the internal pelvic organs, such as chronic metritis, displacements of the uterus, oöphoritis, etc.; but he also attaches great importance to nervous predisposition, consequent upon previous sexual stimulation, and upon pre-existing inflammatory changes due to gonorrhœal infection. A peculiar form of vaginismus is, according to *Veit*, sometimes observed after the birth of the first child; happily the duration of this is usually brief. After parturition the vulval mucous

membrane remains for a time very tender, and when cohabitation is resumed, often too soon, and perhaps, after the enforced abstinence, too frequently repeated at brief intervals, fissures are readily produced. Moreover, vaginismus which has existed prior to parturition may, in some cases, recur after that event. An unusual position of the vulva, undue smallness of the vaginal inlet, and relative impotence of the man, may combine to cause such a recurrence. Finally, vaginismus often persists throughout pregnancy, and manifests itself during parturition. The magical effect which chloroform has in some primiparæ, when the head is delayed at the vulva, is explicable only by the supposition of vaginismus.

According to *Arndt*, vaginismus is not purely a local disorder, but is in many cases the local manifestation of a neuropathic diathesis, which may in some instances lead to general mental disorder.

Olshausen regards hyperæsthesia and vaginismus as different stages of a single disease; he believes that the excessive sensitiveness is seated chiefly in the hymen; he explains the spasm as the reflex result of fissures and inflammatory changes. *Pozzi* considers that excessive nervous irritability and an irritable state of the vulva are the indispensable preliminaries to the occurrence of vaginismus. *Herman* distinguishes between excessive smallness of the vaginal inlet and vaginismus; he regards the latter as a nervous disorder, characterized by hyperæsthesia of the vulva, and by spasmodic contraction of the levator ani and adjoining muscles. *Frost* distinguishes vaginodynia from vaginismus; in vaginodynia the pain is so intense as to cause syncope, and the muscular spasm involves the entire length of the vagina.

It is a notable fact, to which *Veit* has especially drawn attention, that among the poorer classes of the population, vaginismus is practically unknown. Among women of these classes, their sexual needs, not having been so much lessened by "culture," suffice to withdraw their attention even from the pains of defloration, which would otherwise often be very severe; whereas the sexually neurasthenic woman of the upper classes, filled with dread at the idea of the pain she expects to suffer, and not infrequently in a condition of hyperexcitability or hypersensibility dependent upon previously employed abnormal means of sexual gratification, is unable to endure the pains of defloration even when these might be expected to prove far from severe.

In some cases, painful contractions of the vagina, to which we cannot properly give the name of vaginismus, arise from organic diseases of the uterus and the uterine annexa; these painful con-

tractions render copulation impossible. *Von Hofmann* reports the case of a young prostitute, who found herself unable to continue the practice of her profession owing to the severe pain she suffered during intercourse; she died, and the post mortem examination disclosed bilateral salpingitis, with reproductive organs in other respects normal.

Maladroit and incomplete attempts at intercourse, and the consequent repeated failure to obtain complete sexual gratification, affect a woman's nervous system to a varying degree; but apart from this, in women who have long cohabited with men of deficient sexual potency, we often find a remarkable condition of complete relaxation of the genital organs, associated with great hypersecretion of the mucous membrane, flaccidity of the muscles of the pelvic floor, and displacements of the uterus. Moreover, the nervous shock to which the repeated but unsatisfying attempts at intercourse give rise, affects the spinal cord in such a manner that symptoms of spinal irritation ensue. The patient complains of pains in the back, the loins, and the nape of the neck; these pains also radiate round the front of the abdomen and along the intercostal spaces; hyperæsthetic points may be detected when the finger is passed along the spine; there is weakness of the limbs with a sensation of numbness; and neuralgic manifestations of varying nature occur.

The dangers which sexual intercourse may entail upon women—over and above the irritable conditions and inflammatory disorders of the female reproductive organs, dependent upon impetuous or unduly frequent coitus, or upon coitus practised during menstruation—are principally due to gonorrhœal and syphilitic infection transmitted by the cohabiting male.

Cardiac Troubles Due to Sexual Intercourse.

Among the troubles from which women at times suffer as a result of sexual intercourse, certain cardiac disorders are especially worthy of attention.

Every act of sexual intercourse in a young and sensitive woman exercises an exciting influence on the nervous mechanism controlling the cardiac movements, and this influence is more clearly manifested in a degree directly proportional to the intensity of the sexual orgasm. The heart's action is markedly increased in frequency, the cardiac impulse is more powerful, the large arteries of the neck are seen to pulsate far more vigorously, the conjunctiva

is markedly injected, the respiration is increased in frequency, the respiratory movements are more superficial and have a panting character.

But when, in a woman who is sexually irritable in an excessive degree, the peripheral stimulation occurring in the act of sexual intercourse is unusually powerful, there may result a notable increase or modification of the reflex manifestations which normally occur during sexual intercourse in the province of cardiac activity; similar results ensue when there is a summation of stimuli owing to excessive sexual intercourse, or contrariwise when the act of intercourse is broken off just before its physiological climax and the natural termination of the orgasm fails to occur.

The former cause is not infrequent in young wives during the period of the honeymoon. The latter cause is in operation when there are diseases of the female reproductive organs preventing the physiological completion of intercourse; but especially in consequence of the modern practice of coitus interruptus, in which the man breaks off the act of intercourse the moment he feels that ejaculation is imminent, without troubling himself regarding the natural course of sexual excitement in the woman. Yet another cause of excessive cardiac reflex manifestations in women is incomplete potency of the male, which may either cause a premature ejaculation of semen, or may lead to incomplete penetration of the penis.

In all such cases, as a result of sexual intercourse, there may arise cardiac disorders of various kinds; among these, tachycardial paroxysms are the most frequent, occurring either *inter actum*, or at a longer or shorter interval after intercourse.

In several cases of vaginismus occurring in young married women which have come under my notice, it was observed that the attempts at intercourse gave rise to violent involuntary spasmodic contractions of the constrictor cunni and the other muscles of the urogenital and anal regions, and in addition it was found that these attempts were followed by tachycardial paroxysms with dyspnœic manifestations, lasting for a considerable period, it might be as long as one or two hours.

In women who had practised coitus reservatus for a prolonged period, in fact for several years, in such a manner that, notwithstanding the occurrence of intense voluptuous excitement, complete sexual gratification rarely, if ever, occurred—in such women, in whom these marital malpractices seemed to have profoundly influ-

enced their psychical life, I have frequently witnessed a form of reflex cardiac disorder which I must regard as a variety of the multiform neurasthenia cordis vasomotoria. In such women, still at the climax of their physical powers and of their sexual needs, attacks of palpitation suddenly occur at irregular intervals, several times daily or less frequently. Associated with this increased frequency of the cardiac activity are an extremely distressing feeling of anxiety, a sensation of faintness, headache, vertigo, a weakness of the muscular system, and at times actual attacks of syncope. Physically, the women are extremely depressed, irritable, inclined to weep, unhappy, and weary of life. At the same time, digestion is impaired, the appetite is small, and there is constipation. The pulse is in most cases feeble, small, of low tension, easily compressible, increased in frequency, often intermittent, sometimes more distinctly arrhythmical. The heart is found to be sound on physical examination, nor can any abnormality be detected in the great vessels. The lower extremities are free from œdema; the urine does not contain albumen.

Women thus affected are sometimes believed to be suffering from cardiac disorder, in other cases they are subjected to various modes of gynecological treatment; until at length the physician, by appropriate questions, becomes enlightened regarding the true cause of the cardiac disorder, namely, coitus interruptus. If it is possible to prohibit effectually this unwholesome practice, the cardiac symptoms soon cease to recur.

Finally, in women at the climacteric age, cardiac troubles sometimes ensue, which are dependent on interference with sexual intercourse in consequence of anatomical changes in the vagina; changes of this character frequently occur at the time of the menopause; owing to hyperæmic or inflammatory processes, a partial or general stricture of the vaginal passage results; in many cases this passage becomes narrower, shorter, and almost conical in shape, whilst the vaginal inlet is greatly diminished in size. Such a vaginal stricture, which *Hegar* has also seen in younger women after an artificial climacteric (oöphorectomy), interferes with sexual intercourse; and the incomplete sexual gratification gives rise to a series of nervous manifestations, and, among others, to the above described reflex cardiac neurosis.

Whether, and in which cases, the cardiac disorders evoked as a result of the local stimulatory influences of sexual intercourse, are dependent on a reflex stimulation of the sympathetic nerve on the

one hand, or upon a transient paresis of the inhibitory centre of the heart and of the vasomotor centre on the other, cannot here be fully discussed; just as little can we consider in what manner the psyche is sympathetically affected by the irritative processes in the genital organs, and its functional activity thus impaired.

Here I can do no more than briefly state that experience has taught me that sexual intercourse is competent to originate cardiac troubles in women.

1. In extremely sensitive, sexually very irritable women, tachycardial paroxysms may result from sexual excesses.

2. Tachycardial paroxysms with dyspnoea occur in young women affected with vaginismus; also in women at the climacteric with constrictive changes in the vagina.

3. Cardiac troubles, characterized mainly by symptoms indicating diminished vascular tone, occur in women who have long practised coitus interruptus with incomplete gratification of their voluptuous desires.

Dyspareunia.

In normal conditions the act of sexual intercourse is accompanied in women, as in men, by a voluptuous sensation, and this sensation must be regarded as a necessary link in the chain of those processes by which gratification of the sexual impulse—the most powerful of all our natural impulses—is obtained. The absence of this voluptuous sensation in a woman, the state in which she experiences during coitus no voluptuous sensations, but feels either apathy, or positive distaste, is termed dyspareunia: in former times it was also known as anaphrodisia. This abnormal state of sexual sensibility, which up to the present is hardly alluded to in gynecological textbooks, has received remarkably little attention from the medical standpoint, and its importance has been underestimated. Most unfortunately so, for dyspareunia is an important symptom, exercising a powerful influence on the general health of the woman who suffers from it, upon her social status in marriage, and, as is easy to understand, upon her procreative capacity.

Dyspareunia must be clearly distinguished from two somewhat similar conditions, with which at first sight it is liable to be confused, namely, from anæsthesia sexualis, and from vaginismus. By sexual anæsthesia we understand, as previously explained, the absence of the sexual impulse, a symptom which, when the reproductive organs are normal in structure and function, is either of central nervous origin, a result of disease of the brain or spinal cord, or else is due to general nutritive disorders such as diabetes, morphinism,

or alcoholism. A woman affected with dyspareunia does, however, experience the sexual impulse, it may be very actively, but sexual intercourse brings about no gratification of her desires. In vaginismus, on the other hand, the introduction of a foreign body, that is to say of the membrum virile, into the vagina, gives rise to painful reflex cramps of the sphincter vaginae, or of the muscles of the pelvic floor, whereby the completion of coitus is rendered impossible: whereas in dyspareunia coitus can be effected, but gives rise to no voluptuous sensations.

The pleasure which normally occurs in woman during sexual intercourse is brought about in this way, that contact with and friction by the penis stimulates the sensory nerves of the clitoris, the vulva, the vestibule, and the vagina; this stimulus is propagated to the cerebral cortex, where it gives rise to voluptuous sensations, and then, by reflex stimulation of the genito-spinal centre, gives rise to a series of reflex discharges. The pudic nerve, a branch of the sacral plexus, supplies the female external genital organs. Some of its branches pass in the clitoris to a peculiar form of nervous end-organ discovered by *W. Krause*, Krause's genital corpuscles: the structure of these corpuscles appears to fit them exceptionally well for the transmission of stimulatory waves to the nerve centres. "When this stimulus," says *Hensen*, in his work on the physiology of reproduction, "in addition to other effects, also gives rise to a voluptuous sensation, the cause must be sought in central nervous connections and apparatus. Similar relations are to be found in connection with the mechanism of nutrition, for example, in the association of hunger, appetite, agreeable sensations of taste, the act of mastication, and the secretion of saliva." By means of this stimulus, several reflex processes are originated in the reproductive canal, the most notable of which are the erection of the clitoris, and the ejaculation of the secretions of various glands. The cavernous tissue of the clitoris is connected with that of the bulbus vestibuli, and the dorsal nerve of the clitoris is one of the principal nerves of voluptuous sensation. The venous plexus constituting the bulb of the vestibule lies at either side along the margin of the vestibule at the boundary between the labium majus and the labium minus, and laterally it is covered by the constrictor cunni* muscle.

* *Constrictor Cunni Muscle*.—In women the *bulbocavernosus muscles*, right and left, form, as it were, a sphincter to the vaginal outlet. Hence the alternative names of *sphincter vaginae* and *constrictor cunni muscle*. The latter name is in common use in Germany, but, though appropriate, is rarely employed in England.—TRANSL.

During coitus the blood is driven out of this bulb into the glans clitoridis, and thus the sensibility and the erection of the glans are increased. The constrictor cunni and ischiocavernosus muscles draw the clitoris, which is bent at a right angle downwards, into contact with the penis. By means of the pressure of the constrictor cunni, the mucous secretion of Bartholin's glands, which open into the vulva at the back of the labia majora, is expressed.

As additional reflex actions, dependent upon the activity of the reflex centre in the lumbar enlargement of the spinal cord, there ensue contractions of the vagina, peristaltic movement of the tubes, some descent of the uterus, relaxation of the os uteri and rounding of this orifice, and induration of the portio vaginalis, whereby the tubal and uterine mucus and the secretion of the cervical glands are expressed. This process of *ejaculation* constitutes the culminating point of the voluptuous sensation occurring in the sexual act; this act thus exhibits two phases, the sensation of friction, and the sensation of ejaculation.

With regard to voluptuous sensations, and processes analagous to pollutions, occurring in women, we append an extract from *von Krafft-Ebing*.

"The occurrence of voluptuous excitment during coitus is dependent in the women, just as in the man, upon:

"1. The peripheral influence of the intensity and duration of the sensory stimulation (anæsthesia of the genital passage may be the cause of the absence of voluptuous sensation). 2. The condition of excitability of the reflex (ejaculation) centre in the lumbar spinal cord. The activity of this centre varies within wide limits, not merely in different individuals, but in the same individual at different times. There are, indeed, women in whom it seems as if this centre were always in vigorous activity. In normal women, the irritability of the centre appears to be most marked at the menstrual epoch, and to decline rapidly soon after menstruation. In pathological conditions, the activity of the centre may be temporarily in abeyance (organic inhibitory processes, such as are seen in certain cases of hysteria with temporary frigidity); or again the centre may be abnormally active owing to irritable weakness (neurasthenia sexualis), in consequence of which ejaculation may, just as in the male in similar circumstances, occur too easily. 3. The occurrence of the voluptuous sensation in woman is unfavourably influenced by psychical inhibitory perceptions (analogous to the inhibitory influence of psychical processes in the male, such as, for example, fear of incapacity to perform sexual intercourse). As

examples of such inhibitory perceptions in women may be mentioned, dislike of the man, physical loathing to sexual intercourse, etc."

Gutzeit records interesting experiences, which are readily intelligible in view of what we have already quoted. He finds that of ten women after defloration, two only immediately experience full sexual pleasure. Of the eight others, four only have an agreeable sensation produced by the friction during coitus: but the sensation of ejaculation does not make its appearance until the lapse of at least six months, or it may be even several years, after marriage. In the remaining four women, pleasure during sexual intercourse may never become properly established. The women of the first class are described by the author as being of a very ardent temperament, and passionately attached to their husbands. In such women, the sensation of ejaculation occurs during intercourse with any man toward whom they are sympathetic. Women of the second class are of a less ardent temperament, and are often comparatively indifferent toward the man with whom they cohabit. Women of the third class have little or no amatory feeling, and they either hate the man with whom they are cohabiting, or at least feel physical repulsion to the idea of intercourse with him. *Gutzeit* considers that meretrices usually belong to the third category. In the practice of their trade, they make a counterfeit of voluptuous enjoyment, and only experience real sexual gratification in intercourse with the man of their choice.

It is of great practical interest, alike from the gynecological and from the neuropathological standpoint, to determine the consequences in women of ungratifying sexual intercourse. In the present state of our experience it must be assumed that the effect of abnormal sexual intercourse, that is of intercourse which does not culminate in gratification produced by the sensation of ejaculation, is deleterious. This is explained by the fact that, owing to the absence of the muscular contraction of the genital passage, the latter remains engorged with blood; the resultant hyperæmia passes away very slowly, and, when frequently repeated, gives rise to chronic tissue changes, manifesting themselves as diseases of the reproductive organs. Injury to the nervous system ensues, partly in consequence of these organic changes, partly also in consequence of psychical non-gratification in the widest sense of the term. The nervous disorders thus produced are typical forms of (sexual) neurasthenia; and in cases in which the pathogenesis is predominantly psychical (antipathy to the husband, etc.) hysterical types

of disorder are especially frequent. *Von Krafft-Ebing* believes that incomplete coitus, that is, coitus not culminating in the sensation of ejaculation, is a frequent cause of hysterical disorders in women.

When once the clinical picture of neurasthenia sexualis is fully developed, each act of intercourse (like pollutions or coitus in the sexually neurasthenic male) gives rise to renewed troubles, which are easily recognized as symptoms of venous stasis in the reproductive organs (sacrache, sensations of weight and bearing-down in the pelvis, fluor albus): in addition we observe exacerbations of the lumbar spinal disorder, in the form of spinal irritation, irradiating pains in the sacral plexus, etc. In this way general neurasthenia develops. The conditions found in such cases on gynecological examination (chronic endometritis, metritis, oöphoritis, etc.) are produced by the same cause as the nervous symptoms, namely, by an unhygienic mode of sexual intercourse. They are not the cause of the neurosis, but important concomitant disorders; and their effect in rendering the nervous disturbances more severe must be freely admitted.

Among important causes of ungratifying coitus must be enumerated: weak erection and ejaculatio præcox in the male, rendering the stimulation inefficient; in addition, coitus reservatus, coitus interruptus, and coitus condomatus. If the noxious influence is frequently repeated, the occurrence of neurasthenia sexualis and its consequences is greatly to be feared, and in women of neuropathic constitution it is practically inevitable.

Unsympathetic coitus appears to act, not merely in a somatic manner, but mainly upon the psyche, and to originate states of hysteroneurasthenia or pure hysteria. If the influence of such unhygienic conditions of the *vita sexualis* co-operates with that of inherited or acquired sensuality, further dangers ensue: in cases of ungratifying sexual intercourse, the danger of masturbatory; in cases of unsympathetic intercourse, the danger of psychical onanism, or that of marital infidelity.

Although until recently the matter received but little attention, it must now be regarded as a well-established fact, that in the female (as in the male) the climax of voluptuous sensation in sexual intercourse is normally characterized by a process of ejaculation, accompanied by a voluptuous sensation of ejaculation, dependent upon the acme of excitement of a reflex centre in the lumbar enlargement of the spinal cord.

Just as in the male, this centre may be excited to action, not only by local stimulation of the genital organs, but also by (psychical)

stimuli proceeding from the brain (pollutions), so also in the female a similar process may occur, and for this reason it is correct to speak of "pollutions in the female." *Rosenthal* appears to have been the first writer to speak of pollutions in women. In his clinical study of nervous diseases, *Rosenthal* described processes of the nature of pollutions, originated in erotically over-stimulated women by lascivious dreams. In one case he detected the outflow of a "mucus-like" fluid from the apparently intact genital organs; he believed this to proceed from the ducts of Bartholin's glands, and from the mucous glands surrounding the urethral orifice. *Féré* reports the case of a patient who had an erogenic zone in the region of the upper part of the sternum; pressure on this zone gave rise to a profuse secretion of vulvo-vaginal fluid. In this connection we may also recall the "clitoris-crisis" to which tabetic women are subject. *Gutzeit* described the process of pollution in women in the following words: "It is remarkable that in dreams such women experience the sensation of ejaculation."

The psychical preliminary is invariably constituted by lascivious dream perceptions. It merely remains open to question whether this process, which in the male is indisputably physiological, in the female may be said to occur within physiological limits. The researches published by *von Krafft-Ebing* more than twenty years ago, under the title "Concerning Processes Analogous to Pollutions Occurring in the Female," gave negative results as far as healthy individuals were concerned; on the other hand, the phenomenon in question was by no means rare in nervously disordered, and above all in sexually asthenic women. The neurosis was in part found as a result of psychical or manual onanism in virgins with morbidly intensified libido: in part in married women, as a result of ungratifying coitus, as previously described: in part, also, in married women with powerful libido and enforced abstinence from intercourse, owing to acquired impotence or death of the husband.

Just as in the case of the neurasthenic male, these pollutions made the primary neurosis more severe, and relief from the nervous trouble was not obtained until the factor of the "pollutions" had been recognized, and made the object of special treatment. In exceptional cases the "pollutions" appeared to be the starting point of the entire neurosis.

It was further remarkable, again here displaying analogy with what occurs in the male, how much stronger and more deleterious

was the shock-effect of an inadequate process of ejaculation occurring in a sexual dream, as compared with the far less deleterious influence of similar incomplete ejaculation when occurring *viâ coitus*. In very severe degrees of neurasthenia sexualis, just as in the male, the waking imagination may give rise to a "pollution." In such cases the shock-effect on the nerve centres tends to be excessively severe. A still higher degree of irritability of the genital system appears to exist in cases in which excitement and orgasm of the reproductive organs may culminate in a "pollution" by purely spinal paths, without the intervention of the imagination. The significance of this fact would appear to be considerable for the proper comprehension and for the treatment of certain conditions of neurasthenia (sexualis) in the female. The "pollution" may here be the actual cause of the neurosis. But in any case, in the female, the occurrence of pollutions is an extremely important symptom as regards both diagnosis and therapeutics. It is extremely probable that hallucinations of coitus, and the complaints made by insane women of attempted violation during the night, are really dependent upon such "pollutions."

Von Krafft-Ebing reports the following characteristic case. Miss X., thirty years of age, belonging to a family predisposed to insanity, and herself neuropathic since early childhood, declared that since she was six years old she had been subject to lascivious imaginations, to which she became continually more liable as she grew older. Ultimately, typical psychical onanism developed, and in recent years her trouble assumed the form of sexual neurasthenia. The patient herself suspected there was a connection between her nervous disorder and her evil habit. The popular work by *Bock* finally brought her full enlightenment, associated with severe emotional disturbance. This latter was now increased by misfortunes from which the family suffered. The patient then relinquished her bad habit, but her state of health nevertheless became worse. She was nervously extremely irritable; her sleep was insufficient, unrefreshing, and disturbed by lascivious dreams; she suffered from spinal irritation, anæmia, scanty and painful menstruation. Inclination toward the opposite sex and toward marriage, hitherto but slight, now sank to a minimum: on the other hand, the patient, in spite of all efforts to the contrary became more and more subject to a condition analogous to priapism in the male, a genital orgasm by no means voluptuous in character, and often indeed actually painful. Associated therewith, nocturnal pollutions occurred, the

patient awaking from lascivious dreams with a voluptuous sensation and moistness of the external genital organs. After such pollutions, throughout the ensuing day, she felt extremely weary and depressed and suffered from severe spinal irritation. After a time, the nocturnal pollutions occurred without being preceded by lascivious dreams, and ultimately analogous states were experienced in the daytime. With much difficulty the patient now made up her mind to seek medical advice. She was anæmic, emaciated, emotional, and moody. The lumbar and cervical regions of the spine were extremely sensitive to pressure. Sleep was scanty and unrefreshing, the patient felt weary and miserable, she complained of dragging sensation and other paralgic sensations, in the regions supplied by the lumbar and sacral plexuses. The deep reflexes were increased. She dreaded the onset of disease of the spinal cord, and believed that the cause of her illness was to be found in the prolonged indulgence in psychical onanism. The perusal of *Bock's* book had first made her understand the true nature of her misconduct. She had never practised manual masturbation. Her principal complaint was of an almost unceasing uneasiness and excitement in the genital organs. She compared it to the uneasiness in the stomach produced by hunger. In the genital organs (which on examination appeared quite normal), she had a distressing sense of burning heat, of pulsation, of disquiet as if there were a clock-work mechanism working there. Very rarely now were these sensations associated with voluptuous ideas. This sexual neurosis had an intensely depressing constitutional effect. She had transient relief only when the local sensations culminated in pollution; but this, on the other hand, increased her general neuropathic troubles. She suffered most severely during the menstrual period. She was ordered sitz-baths at a temperature of 23° to 19° R. (84° to 75° F.), suppositories of monobromide of camphor, 0.6 (9 grains), with extr. belladon. 0.04 ($\frac{3}{8}$ gr.), sodium bromide 3.0 to 4.0 (45 to 60 grains), every evening; also powders containing camphor 0.1 (1½ grains), lupulin 0.5 ($\frac{3}{4}$ grain), extr. secal 0.08 (1¼ grains), twice daily. This treatment gave the patient great relief, and secured complete ease during the daytime. Therewith returned her greatly impaired trust in the future, and her emotional calm was restored.

The frequent occurrence of pollutions in women, the so-called vulvo-vaginal crises and clitoris-crises, is regarded by *Eulenburg* as a striking manifestation of sexual neurasthenia in woman; in

such cases a lascivious dream is spontaneously followed by a more or less abundant discharge of the clear gelatino-mucous secretion of Bartholin's glands. In women who masturbate, and in tribadists, a profuse and even violent secretion of these glands is produced by touching the clitoris or the erogenic zones at the entrance to the vagina, close to the orifices of Bartholin's ducts.

Dyspareunia, the absence of voluptuous sensation in women during coitus, may be referred to three fundamental causes:

1. Insufficient or completely wanting peripheral stimulation of the sensory nerve terminals in the female reproductive canal: in these cases the conducting tracts to the nerve centres never become active.

2. Diminution or cessation of the excitability of the reflex centre in the lumbar enlargement of the spinal cord: this leads to failure of the sensation of ejaculation.

3. Inhibitory influences proceeding from the cerebral cortex whereby voluptuous sensations and perceptions are checked.

The first-named of these etiological influences is in my experience the commonest. Incomplete or quite inadequate stimulation of the sensory nerves of the genital canal may be due to the maladroit performance of copulation on the part of the male, owing to inexperience, or it may depend on gross disproportion in size between the reproductive organs of the man and the woman; in other cases it may be due to disease of the reproductive organs in either sex, influencing unfavourably the sensibility to stimulation of the nerves of the genital canal. Awkward or incomplete performance of coitus may thus lead to failure of voluptuous sensation, and this may ultimately pass into permanent dyspareunia. Temporary dyspareunia is very common in young wives during the first months of married life, ensuing on the pains of defloration; and very gradually gives place to normal voluptuous sensation. It may be one or two years after marriage before the sensation of ejaculation is first experienced. Not infrequently, dyspareunia depends on incomplete potency in the husband, who is incompetent to arouse voluptuous sensation in his wife. For this reason, dyspareunia is common in young women married to elderly men; but is common also, where (as so frequently among Russo-Polish Jews) the men also marry very young, at an age of from sixteen to seventeen years, and where, moreover, the husband has often before marriage impaired his potency by masturbation: finally dyspareunia is common when girls still undeveloped sexually are married to powerfully built men.

Regarding the pathological conditions of the female reproductive organs which counteract the peripheral sensory excitants of voluptuous sensation, we exclude from further consideration the obvious causes, absence and atrophy of the reproductive organs, and senile marasmus. Of prime importance as a cause of the failure of sexual sensibility in the early period of married life must be mentioned inflammation of the fossa navicularis, due to awkward attempts at intercourse. Other causes of deficient sensibility are: complete or partial persistence of the hymen, lesions of the vaginal inlet, acute or chronic vulvitis in consequence of irritating abundant secretion, especially as a sequel of gonorrhœal vaginitis. The last named infective disorder is especially harmful, because Bartholin's glands are involved in the associated vulvitis. Even after the cure of the vulvitis, permanent dyspareunia may remain. Perineal fissures may result in the stimulant effect of coitus being insufficient, owing to the slight friction possible at the vaginal inlet in these cases. Not less serious sometimes are small, hardly discernible fissures in the vagina. Additional causes of deficient sexual sensibility are recto-vaginal, and vesico-vaginal fistulæ.

The second cause of dyspareunia, diminution or complete lack of irritability of the reflex centre of the lumbar enlargement of the spinal cord, appears to be less frequently operative. We must, however, assume that certain nervous disorders, such as hysteria and pathological changes in the spinal cord, are responsible in this connection. The activity of the lumbar sexual centre appears in women to be normally subject to variation within certain limits; and seems usually to attain its maximum irritability during menstruation. But normally these variations are never so great as to produce in women complete though merely temporary dyspareunia; in this respect offering a marked contrast to what occurs in other animals at other times than the rutting season, and of which every bitch not on heat furnishes an example when she refuses the sexual advances of the dog.

As regards the third causal influence in the production of dyspareunia, the influence of the brain, this, though important, is less frequently in operation. Diseases of the brain, degenerative processes, may constitute a cerebral cause for the failure of sexual sensation. But more frequently, certain cortical perceptions, such as dislike or hatred of the cohabiting male, an ardent passion for some other lover, grief and trouble, exercise inhibitory influences, which render the occurrence of voluptuous pleasure during the sexual act difficult or quite impossible.

A condition like dyspareunia, our knowledge of which depends entirely upon the subjective sensations of the woman concerned, is naturally one regarding whose existence accurate information is difficult to obtain. Very rarely does it happen that women spontaneously approach the physician with complaints of this condition; indeed, in my experience, they do so only when they are sterile, and when they assume, in accordance with the widespread popular belief, that their sterility is connected with the absence of voluptuous sensation during sexual intercourse. More commonly, however, it is the husband who feels it his duty to confide to the medical man the remarkable apathy of his wife in sexual intercourse. But when once the medical man's attention has been directed to this question, and when he institutes enquiries among his patients in a scientific, passionless manner, one making due allowance for a woman's modesty, as the moral importance of the subject demands, he will be astonished at the frequency of dyspareunia, and he will find herein the explanation of many obscure phenomena in the life of women. On the other hand, it must never be forgotten that a certain number of women complain of dyspareunia without any justification whatever, in order to arouse interest and sympathy, by representing themselves as unwilling sacrifices on the marital altar: the experienced gynecologist will readily detect the cases in which he is being misinformed; he can, moreover, always check the wife's statements by conversation with the husband.

The constant sign of dyspareunia is the failure of ejaculation during coitus. We have previously described the muscular contractions which lead to ejaculation of the secretion of Bartholin's glands and to the expulsion of the uterine and cervical mucus, as reflex actions evoked by the sensory stimulus dependent on friction of the female genital organs. The voluptuous sensation of ejaculation, associated with these muscular contractions, which the woman whose sensibility is normal experiences as the culminating point of her sexual "gratification," is either quite unknown to a woman affected by dyspareunia, or is experienced by her only in a voluptuous dream, as a pollution, in which the sexual dream-perceptions act as the psychical stimuli by which the reflex discharge is originated. It has repeatedly happened to me, that on enquiring of women suffering from dyspareunia regarding their experience of the sensation of ejaculation, I have been informed that such sensations are known to them only from the descriptions of their female friends, or occasionally from dreams from which

they have awakened with a feeling of moisture in the external genitals. *Von Krafft-Ebing* refers this process to a peristaltic contraction of the muscular fibres of the Fallopian tubes and the uterus, "whereby the tubal and uterine mucus is expressed;" whereas, for my part, I am of opinion, that ejaculation affects in the first place and principally the glands of Bartholin, the secretion of which is expressed by the contraction of the constrictor cunni muscles, and secondarily only affects the cervical glands of the uterus.

As a second sign of dyspareunia, I recognize a remarkably rapid outflow of the male semen from the female genital canal, immediately after coitus (*profluvium seminis*). The woman thus affected complains, when suitably questioned, that she is unable to retain the semen, and that it flows out of the vagina immediately after ejaculation. The cause of this remarkable phenomenon no doubt lies in the fact, that, owing to the absence of the voluptuous sensation, the reflex contractions of the muscles of the female genital organs, normally accompanying this sensation during intercourse, fail to occur. At the vaginal inlet, in normal conditions, the constrictor cunni muscle contracts, and farther up in the vagina a peristaltic contraction of the circularly disposed muscular fibres of the tunica media occurs: in this way the semen ejaculated into the vagina is for a time retained under a certain pressure. But in the absence of these muscular contractions, as well as of the muscular contraction of the pelvic floor, retention of the semen fails to occur. Cattle-breeders and horse-breeders have made similar observations regarding cows and mares, namely, that these animals are sometimes unable to retain the semen after coitus, and it is suggested that in these cases the animals are not properly on heat. Experienced cattle-breeders recommend in such cases that the retention of the semen should be promoted by douching the root of the tail and the external genitals with cold water. It is well known that by stimulating the peripheral sensory nerves in the neighbourhood of the genital organs, a reflex excitement of the lumbar sexual nerve centre is produced, as is seen, for example, in the practice of flagellation of the buttocks, for the increase of sexual desire.

Passing to the consideration of the pathological changes to be found in the reproductive organs of women suffering from dyspareunia, the nature of these will for the most part be obvious in relation to the etiology of the disorder. Most frequent, in my experience, were chronic inflammatory states of the vulva and of the vaginal and uterine mucous membrane, chronic metritis and para-

metritis. A very frequent appearance, and one practically characteristic of dyspareunia when of long standing, is a marked total relaxation of the reproductive apparatus. The uterus is extremely mobile, usually retroverted and partially prolapsed, thin, with lax walls, and usually an enlarged cavity; the portio vaginalis is flaccid, and runs to a point; the vagina is roomy; there is marked hypersecretion of the mucous membrane of the entire genital canal; there is great flaccidity of the constrictor cunni and levator ani muscles, and of the perineum. In several women with dyspareunia, I found old unhealed lacerations of the perineum. In some cases, the very small size of the clitoris is noteworthy. In one case amenorrhœa was present with an infantile uterus. In a large proportion of the cases I was able to detect a diminution both of the tactile and algic sensibility of the vaginal mucous membrane. The women were for the most part anæmic; many were extremely obese, and of lymphatic constitution. In some cases, however, no pathological changes whatever could be detected in the reproductive apparatus.

Dyspareunia is a condition which affects a woman's whole nature, powerfully influences her mental life, and thus gives rise to greater psychical than physical damage. The consciousness of being deprived of the greatest joy of physical love produces great emotional depression, even in a woman by no means sensually inclined, and gives rise to a hypochondriacal state, at times even to melancholia. In other cases, the idea, not infrequently suggested by more happily situated women friends, that the woman herself is not to blame for this condition, has a demoralizing effect upon her, and destroys the happiness of married life. (It has been confessed to me, in isolated cases, that the dyspareunia was relative only.) Apart from this, the absence of sexual gratification gives rise to a series of nervous troubles, presenting either the variable characters of hysteria, or else the symptoms of neurasthenia. Finally, the frequently repeated incomplete coitus, incomplete inasmuch as the woman does not experience the sensation of ejaculation, induces chronic hyperæmia in the female reproductive organs, passing on into blood stasis, and ultimately into chronic inflammatory tissue changes; in this way arise metritis, perimetritis, and parametritis, salpingitis, oöphoritis, disorders of menstruation, menorrhagia, and atypical uterine hæmorrhages. The possibility cannot be disproved, that in this way new-growths of the reproductive organs may also originate. The act of sexual intercourse, which at first may be to

the woman a matter of comparative indifference, and in which she plays her part merely from a sense of duty, becomes, in cases of long-standing dyspareunia, something to which she feels a positive dislike, and is recognized by her as the actual cause of the troubles that ensue upon intercourse, such as sacrache, sensations of weight and pressure in the pelvis, strangury, fluor albus, a feeling of exhaustion, etc.

At times, perverse sexual sensation is associated with dyspareunia. Women who find no enjoyment in normal sexual intercourse with a male, sometimes masturbate, sometimes indulge in amor lesbicus, etc.

Of great importance appears to me the relation between dyspareunia and sterility in women. As already pointed out, dyspareunia comes chiefly under medical observation in cases in which it is associated with sterility. The husband, seeking advice concerning his wife's failure to conceive, complains of her frigidity in sexual intercourse as the probable cause; or the wife comes to seek advice, saying that she never experiences sexual gratification, and that for this reason she has failed to become pregnant. As a matter of actual fact, dyspareunia and sterility are associated with such remarkable frequency, that my own experience leads me to believe in the existence of an etiological connection between the two conditions, at least in a certain proportion of the cases. Among 69 sterile women whom I questioned regarding dyspareunia, the latter condition was present in 26, that is to say, in 38% of the cases. *Matthews Duncan* reported that of 191 sterile women, 62 did not experience sexual enjoyment. Sexual excitement of the woman during copulation would certainly appear to have a definite bearing upon the occurrence of conception, for we know that by the voluptuous sensation reflex actions are aroused in the genital canal, favouring the retention of semen and its passage through the os to the interior of the uterus, and perhaps also giving rise to reflex changes in the cervical secretion which favour the passage of the spermatozoa into the uterine cavity.

In cases of relative dyspareunia, the influence of this condition in producing sterility is also manifested, the unfaithful wife being impregnated by her lover though she has remained sterile in intercourse with the husband to whom she is indifferent. To dyspareunia of this nature (dependent upon sexual disharmony), we may also refer the sterility of a married pair who have for some time lived together in unfruitful intercourse, whereas, after divorce and the contraction of fresh unions, both the man and the woman

prove normally fertile. Such cases have been personally known to me; and similar instances aroused the attention of the natural philosophers of antiquity, for instance, that of Aristotle. The importance of voluptuous sensation in promoting conception is also manifest from the fact that in the majority of women, after the pains of defloration, dyspareunia usually persists for a season during the early period of married life; and, corresponding with this, the first conception is usually deferred for some little time after marriage, to a period corresponding with the awakening of the sensation of ejaculation. In this connection, *Courty* reports the case of a lady who, although in blooming health, remained sterile during the first fifteen years of her married life; she then gave birth to a child whose father was unquestionably her lover; and after this in succession to two other children whose progenitor was the legal husband. This lady had never experienced voluptuous sensation in intercourse prior to the time of her first conception. Similar circumstances with an even clearer significance have been frequently observed among the lower animals; and *Darwin* records several striking observations of this character. Taking all the evidence into consideration, we are compelled to regard dyspareunia as a condition capable of causing sterility in women, although the sequence is not an absolutely necessary or invariable one.

In order to excite voluptuous sensation during intercourse, savage races make use of various means, some of which we here transcribe from the work of *Ploss-Bartels*. In Abyssinia, and on the Zanzibar coast, young girls receive instruction in certain rotary muscular movements known by the name of duk-duk, which they employ during coitus for the increase of sexual pleasure. Many Daiaks perforate the glans penis with a silver needle from above downwards; this needle is kept in place like a seton, until a permanent canal is formed through the glans: in order during coitus to stimulate the woman more powerfully, into this canal, just before coitus, various small articles are inserted, such as little rods of brass, ivory, silver, or bamboo, or silver instruments ending in small bundles of bristles; these project from the surface of the glans, and exercise a more powerful friction of the vagina, thus increasing the sexual pleasure of the woman. Men without such an apparatus are rejected by the women, whilst those who have made several such canals in the glans, and can therefore insert several instruments, are especially sought after and prized by the women. Such an apparatus is known as an ampallang, and

in a symbolic manner the woman indicates to a man of her choice her desire that he should make use of one; he finds in his bowl of rice a rolled-up leaf, enclosing a cigarette which represents the size of the desired ampallang. Among the Alfurs of North Celebes, in order to increase the voluptuous pleasure of the woman during intercourse, the men bind round the corona glandis the eyelids of a goat, beset with the eyelashes, thus forming a bristly collar; in Java and in Sunda, before coitus, the men surround the penis with strips of goat-skin, leaving the glans free. In China they wind round the corona glandis torn fragments of a bird's wing; these also project like bristles and increase the friction. Among the Batta of Sumatra, travelling medicine-men perform an operation by means of which they insert, beneath the skin of the penis, small stones, sometimes to the number of ten, at times also angular fragments of gold or silver; these heal in beneath the skin, and increase the stimulus of coitus for the women. Among the Malays of Borneo the penis is perforated, and some fine brass wire with the ends turned inwards is inserted: before coitus, the sharp ends of the wire are drawn out so as to project from the skin.

In our own part of the world, voluptuaries make use of an india-rubber ring beset with spines, which before coitus is passed over the corona glandis, in order to promote sexual gratification in the woman during intercourse. In cases of diminished potency in the male, in order to produce sufficient sexual excitement in the female by more powerful erection of the penis, various mechanical means are now employed. For instance, in such a partially impotent man, a constricting band of india-rubber may be passed over the root of the penis, whereby the reflux of blood from the corpora cavernosa is hindered, and a more complete and more enduring erection is induced. Elderly men have frequently declared to me that they were well satisfied by the employment of this simple measure, whilst behind their backs, their wives have assured me that the results were far from satisfactory. The apparatus described by *Roubaud* for the enlargement of the penis is no longer employed. Partially impotent men make use, however, of an instrument known by the name of "schlitten," made of gold, silver, or white-metal; it consists of two delicate laminæ, united at the base by a metal ring, and at the upper end by an india rubber ring. This small apparatus, which must be made exactly to measure, renders possible the introduction of the imperfectly erect penis into the vagina; it supports the penis, and readily accommodates itself to the change in size of the organ as it slowly becomes erect.

FERTILITY IN WOMEN.

Fertility in women is the basis of the fecundity of a nation, of its growth, its power, and its importance. It is especially the fertility of married women which enters here into consideration, and forms the source of the statistical data of fertility; these are usually obtained by drawing a ratio between the number of marriages contracted in a given period, and the number of children born in the same period.

The fertility of women is a function beginning at an age varying in dependence on many conditions, and undergoing extinction at a definite period of life. It is, in fact, associated with the duration of the sexual life of woman, and, generally speaking, extends from the sixteenth to the fiftieth year of life. Climate, race, constitution, and morbid conditions, influence alike the first appearance of menstruation and the first pregnancy; and as they influence the duration of menstrual activity, so also do they influence the duration of fertility.

In the Bible are recorded numerous instances of the early commencement of fertility. At the present time also, in warm climates we meet with many examples of early motherhood. From the great work of *Ploss-Bartels*, from which we have already frequently quoted, we extract and summarize the following ethnographical details. Among the wives of the Bosjesman, mothers aged ten are frequently seen; travellers in New Zealand often saw mothers of eleven years, and mothers of the same age among the Samoyedes and in Palestine; mothers of twelve in British Guiana, in Jamaica, among the Schangallas, at Shiraz in Persia, among the Copts in Egypt; mothers aged thirteen in Cuba, among the Sioux and the Dakotas, and in New Caledonia; mothers aged fourteen among the Negroes of Gaboon.

According to the observations of Robertson, of sixty-five Indian women there gave birth for the first time:

At the age of 10 years.....	1
At the age of 11 years.....	4
At the age of 12 years.....	11
At the age of 13 years.....	11
At the age of 14 years.....	18
At the age of 15 years.....	12
At the age of 16 years.....	7
At the age of 17 years.....	1

Moreover, in the records of European countries, we find numerous instances of very early motherhood. *Molitor's* case, a girl nine

years old giving birth to a vesicular mole with an embryo; *von Haller's* case, pregnancy in the ninth year of life; *Carus'* case, pregnancy at the age of eight. *Caspar* saw a girl in Berlin who became pregnant at the age of twelve, and was delivered of a living child. *Rüttel* saw a girl nine years of age pregnant. *King* attended the confinement of a girl who at the time of her delivery was not yet eleven years old. *Taylor* reports the case of a girl twelve years and six months of age who was then in the last month of pregnancy. *Koblanck* attended a girl of fourteen who was delivered of a child weighing four and a half pounds.

In most of these cases the premature fertility is followed by a premature cessation of fertility. And there is more or less truth in *Bruce's* statement regarding the Arab women in Africa, that those who began to bear children at the age of eleven were seldom still fertile at the age of twenty.

At times we may observe a remarkable extension of fertility beyond the average age, that is, beyond the age of fifty years.

In northern Europe pregnancy at a comparatively advanced age is by no means rare. From the official statistics of Denmark we learn that among 10,000 women, 465 were delivered at ages between 50 and 55 years. In Sweden, of 10,000 mothers, 300 gave birth to children when more than 50 years of age. In Ireland, the proportion of mothers over 50 was 345 per 10,000. In England the official figures dealing with the delivery of 483,613 women, showed that 7,022 were between 45 and 50 years of age, and 167 over 50 years of age.

The Surgical Academy of Paris, in an authoritative statement regarding the late age at which conception could take place, alluded to the fact that *Cornelia*, of the family of the *Scipios*, gave birth to *Volusius Saturninus* when sixty years of age, that the physician *Marsa* in Venice recorded the existence of pregnancy in a woman of sixty, that *de la Motte* recorded pregnancy in a woman of fifty-one, and that he believed it to be true that another Parisian woman had given birth to a girl at the age of sixty-three, and had herself suckled the infant.

In an important case, however, which came before the Court of Chancery in England, the court held that there was no definite evidence of the possibility of pregnancy in a woman sixty years of age; but that the greatest age at which, in England, pregnancy had indisputably occurred, was 54.

Among 4,925 deliveries occurring in the Prague Maternity Hos-

pital, *Schwing* reports that there were 9 women delivered for the first time when over 40 years of age. Of these:

3 were 41 years of age.
 2 were 42 years of age.
 1 was 43 years of age.
 2 were 44 years of age.
 1 was 47 years of age.

Haller reports the cases of two women who gave birth to children, one at the age of 63, the other at the age of 70 years. *Meissner* delivered a woman of 60 years of her seventh child; *Rush* attended the delivery of a woman aged 60; *Deweese* that of a woman aged 61. *Mende* and *Bernstein* report cases of delivery at the age of 60. *Marion Sims* saw, in the state of Alabama, a negro woman 58 to 60 years of age, who gave birth to a child at this age, at an interval of twenty years since her last pregnancy. *Nieden* reports a case in which the first pregnancy occurred 26 years after marriage. When married, the wife was 18 years of age, the husband 30; during their first twenty-five years of married life there was no sign of pregnancy, but when the wife was 44 years of age, menstruation, hitherto regular, suddenly ceased; the cause of the cessation proved to be pregnancy, and at term a healthy girl weighing nine pounds was born; the mother was able to nurse the child herself. *Smith* attended a woman aged 52 who was delivered of twins; the youngest of her eight other children, who were then all living, was ten years of age.

Rodsewitsch collected from the Russian literature of the years 1872 to 1881, eleven cases in which women aged 50 to 55 had given birth to children. *Talquist* reports that in Finland, in the year 1883, a woman 58 years of age was delivered; whilst *Ansell* records the case of an Englishwoman who became a mother when 59 years of age. *John Kennedy* records the case of a woman of 62 who was normally delivered at this age; she had begun to menstruate at the age of 13, and since the age of 20 had previously given birth to 21 children, the last five when she was 47, 49, 51, 53, and 56 years of age, respectively. *Prior* even reports the case of a woman 72 years of age, who not only menstruated, but had an abortion(!)

The ideal of fertility in women is that the first completed act of sexual intercourse should be followed immediately by conception, that the pregnancy should terminate after the normal lapse of time in the birth of a child, and that the same process should be

repeated at intervals of about ten months until the end of active sexual life. In actual experience, however, this never occurs. Fertilization as an immediate consequence of the first act of sexual intercourse (which in the lower animals is regarded as the rule) is a very rare occurrence in human beings. Moreover, in no single marriage is the reproductive capacity of the wife utilized to the full, up to the time of extinction of her generative faculty; either because the potency of the male partner undergoes a gradual decline, or, it may be, because, after a while, sexual intercourse becomes less frequent, or because precautions against procreation are taken.

The number of children to which during the three decades of her sexual life, from the menarche to the menopause, a woman might theoretically give birth, is never actually born. If we assume that, during the period of active sexual life, a woman requires a period of fifteen months to two years for each pregnancy, parturition, and lactation, a woman could easily during this period have fifteen or sixteen children, and this figure would represent the normal product of the normal fertility of the human female. There are indeed, women who, it may be in consequence of an exceptionally long period of sexual activity, or through giving birth repeatedly to twins or triplets, or because they have married several husbands in succession, have given birth to twenty-four children or even more. In Berlin, in the year 1901, there lived a woman 41 years of age who had had 23 children; there were three women, aged respectively 40, 43, and 46 years, who had had each 21 children; 246 women with families numbering 13 to 20; and 169 women each of whom had given birth to 12 children. In the very great majority of cases, however, the fertility of the wife of the present day is never fully developed. It is modified in various ways by the conditions of marriage, by social circumstances, by considerations relating to the health of husband or wife, by actual illnesses, and by voluntary limitation of fertility. Generally speaking, according to the investigations of *Quetelet*, *Sadler*, and *Finlayson*, the fertility of women is greatest in marriages in which the husband is as old as the wife, or a little older, but without marked difference in age. Marriages contracted at a very early age are less fruitful; the highest fertility is found in marriages contracted when the husband is 23 and the wife 26 years of age.

Conception does not generally take place until sexual intercourse has been frequently repeated. As the result of a statistical enquiry

of my own, relating to 556 fruitful marriages, I ascertained that in these the first delivery occurred:

Within 10 months after marriage in 156 cases.

Within 11 to 15 months after marriage in 199 cases.

Within 16 to 24 months after marriage in 115 cases.

Within 2 to 3 years after marriage in 60 cases.

More than 3 years after marriage in 26 cases.

Thus we learn that in 35.5% of the cases the first delivery occurred within $1\frac{1}{4}$ years after marriage; in 15.6% within 10 months; and in 19.9% within 15 months after marriage; and 11.5% of the cases, the first delivery was more than $1\frac{1}{4}$ years and less than 2 years after marriage; in 6.0% it was between 2 and 3 years after marriage; and in 2.6%, the first delivery did not occur until more than 3 years after marriage.

From examination of the birth registers of Edinburgh and Glasgow, *Matthews Duncan* determined the mean interval between marriage and the birth of a living child to be seventeen months. In the majority of cases, the first delivery does not occur until a complete year has elapsed since marriage; in fact, in nearly two-thirds of the instances the first delivery occurs during the second year of married life.

The interval between two successive births is, according to *Matthews Duncan*, on the average 18 to 24 months, according to *Goehlert*, 24 to 26 months; the latter, however, points out that in cases in which the child dies very soon after birth, the birth of the next child ensues on the average in 16 to 18 months. In this connection, we must not fail to take into consideration the influence of lactation, inasmuch as mothers who do not suckle their children become pregnant considerably earlier, on the average, than those who undertake this duty. In reigning families, for instance, it is by no means uncommon for the consort to be delivered twice within a single year. The degree to which lactation hinders conception is so widely known, that women often suckle their infant for a very long period, with the definite aim of preventing the speedy recurrence of pregnancy. A high official from the Dutch Indies informed me that for this reason the native women were accustomed to suckle their infants for several years, and that it was by no means uncommon to see a small boy running about smoking a cigar, and then hurrying to his mother in order to be suckled.

The age at which a woman contracts marriage has also to this extent an influence upon her fertility, inasmuch as it appears that those who marry very young are far less fertile than those who

marry between the ages of 20 and 25 years; the latter moreover have, on the average, a shorter time to wait for their first conception than women who marry before the age of 20. Women who marry after the age of 25 have to wait longer after marriage for their first delivery; in fact the older the woman after 25, the greater, on the average, the interval between marriage and the first delivery.

Arranging the data already referred to, regarding 556 fruitful women, in relation to this point of view, it appears that the first birth ensued:

	Within 10 months of mar- riage.	10 to 15 months after mar- riage.	15 months to 2 years after mar- riage.	2 to 3 years after mar- riage.	More than 3 years after mar- riage.
In 163 women marrying at ages 15 to 20 years.	36	53	46	18	10
In 313 women marrying at ages 20 to 25 years.	98	113	56	32	14
In 70 women marrying at ages 25 to 33 years.	18	30	12	9	1
In 10 women marrying at ages over 33 years.	4	3	1	1	1

To give percentages, the first birth occurred,

	Within 10 months of mar- riage.	10 to 15 months after mar- riage.	15 months 2 to years after mar- riage.	2 to 3 years after mar- riage.	More than 3 years after mar- riage.
Women marrying at ages 15 to 20 years, in.	22.0%	32.5%	28.2%	11.0%	8.1%
Women marrying at ages 20 to 25 years, in.	31.3%	36.1%	17.8%	10.2%	4.4%
Women marrying at ages 25 to 33 years, in.	25.7%	42.8%	17.1%	12.8%	1.4%
Women marrying at ages over 33 years, in.	40.0%	30.0%	10.0%	10.0%	10.0%

Thus whereas in women who contracted marriage between the ages of 15 and 20 years, only 54.5% were confined for the first time within 15 months after marriage, in women who contracted marriage between the ages of 20 and 25 years, in 67.4% the first delivery occurred within 15 months of marriage. And whereas in those who married at the earlier age, the percentage of first deliveries occurring between 15 months and 2 years after marriage was 28.2, in those who married between the ages of 20 and 25, the percentage of first deliveries after the stated interval was only 17.8.

The figures compiled by *Whitehead* and *Pfannkuch* give similar results. Of 700 women who married between the ages of 15 to 20 years, there were 306 only who gave birth to a child within the first two years after marriage; whereas of 1,835 women who married between the ages of 20 and 25 years, no less than 1,661 gave birth to a child within two years after marriage — a percentage of 43.7 in the former case, and 90.6 in the latter case. *Pfannkuch*, as the result of a very large collection of figures relating to this question, found that in women marrying before the age of 20 years, the average number of months before the first delivery was 26; whereas in women marrying after the age of 20 years, the average number of months before the first delivery was 20.

According to *Matthews Duncan*

OF EVERY 100 WOMEN WHO MARRY	THERE BECAME MOTHERS	
	In the 1st year of married life.	In the 2d year of married life.
Between the ages of 15 and 20 years.....	13.71	43.70
Between the ages of 20 and 25 years.....	18.48	90.51
Between the ages of 25 and 30 years.....	12.41	75.80
Between the ages of 30 and 35 years.....	11.44	62.93
Between the ages of 35 and 40 years.....	9.27	40.97

Sadler examined the relationship between the age at which marriage was contracted and the number of offspring in the case of the wives of English peers. He obtained the following results:

Age at marriage.	Births per marriage
12 to 16 years.....	4.40
16 to 20 years.....	4.63
20 to 24 years.....	5.21
24 to 28 years.....	5.43

From exact statistical data of births in the Scandinavian countries of Europe (Denmark, Sweden and Norway), *Goehfert* compiled the following table, showing the percentages of fertility at various ages:

AGES.	MARRIED WOMEN.			UNMARRIED WOMEN.		
	Denmark.	Sweden.	Norway.	Denmark.	Sweden.	Norway.
Under 20 years.....	1.0	1.0	0.7	9.1	7.0	4.9
From 20 to 25 years....	13.9	12.8	11.9	43.9	35.1	37.0
From 25 to 30 years....	26.5	24.7	24.7	28.1	27.9	32.4
From 30 to 35 years....	26.7	26.1	25.3	11.4	16.8	14.9
From 35 to 40 years....	21.0	21.6	21.3	5.4	9.0	7.1
From 40 to 45 years....	9.9	12.0	13.0	} 2.1	4.2	3.7
Over 45 years.....	1.1	1.8	3.1			

From this table it appears that the fertility of married women increases steadily up to the age of 35 years, but after this age it begins to decline. What a marked influence the age at marriage has upon fertility is shown by the comparison of the figures relating to married women with those relating to unmarried women; the fertility of unmarried mothers attains its maximum at the ages of 20 to 25 years. In the countries under consideration the average age of women at the time of marriage is 25 to 27 years.

In order to obtain a still clearer picture of the fertility of women in relation to age, *Goehfert* has combined the figures relating to the married and the unmarried, and then calculated the percentages, with the following results:

AGES.	MARRIED AND UNMARRIED WOMEN.		
	Denmark.	Sweden.	Norway.
Under 20 years.....	1.7	1.6	1.1
From 20 to 25 years....	16.6	15.1	14.1
From 25 to 30 years....	26.6	25.0	25.3
From 30 to 35 years....	25.3	25.1	24.4
From 35 to 40 years....	19.6	20.4	20.0
From 40 to 45 years....	9.2	11.2	12.2
From 45 to 50 years....	} 1.0	1.6	2.9
Over 50 years.....			

If, finally, we combine into a single table the figures relating to all three of these countries, we obtain the following results:

Under 20 years.....	1.5%
From 20 to 25 years.....	15.3%
From 25 to 30 years.....	25.6%
From 30 to 35 years.....	24.9%
From 35 to 40 years.....	20.0%
From 40 to 45 years.....	10.9%
Over 45 years.....	1.8%

From these figures it appears that the maximum fertility of married women is attained, in Denmark at the age of 31, in Norway at the age of 31.7, and in Sweden at the age of 32 years. In the case of unmarried women, the maximum fertility is at the ages of 24 to 26 years. In the Austrian Empire, the maximum fertility of women is attained at about the age of 30 years; in England it is attained between the ages of 20 and 25 years.

Divergent results as regards the fertility of married women at different ages were obtained by *Goehlert* from the examination of 5,290 cases from the reigning families of Europe. In the favourable position as regards means of subsistence occupied by the members of these families, marriage naturally occurs, in most cases, much earlier in life, the mean age at marriage being between 19 and 22 years—the youngest mother (in the Capet dynasty) was only 13 years of age—and for this reason the figures relating to the younger age-classes are larger than in the previous tables. But as a result of this, the reproductive capacity also undergoes an earlier extinction, so that of these women, not one gave birth to a child when she was over 50 years of age. *Goehlert* gives the following table, compiled from these 5,290 instances:

Under 20 years.....	8.8%
From 20 to 25 years.....	25.4%
From 25 to 30 years.....	29.4%
From 30 to 35 years.....	21.6%
From 35 to 40 years.....	11.5%
Over 40 years.....	3.3%

In these cases the maximum fertility was obtained at the age of 27.

The physiological fertility of women is much more clearly manifested when we compare the fertility of women who have been married a few years only, with the fertility of women in the later years of married life. In the earlier period, the effective fertility more nearly approaches the physiological fertility, because at this time the various influences by means of which fertility is

later so greatly diminished have not yet come into operation. In this connection the following data, published by *Körösi*, regarding the percentage fertility of recently married women, and that of married women in general, will be found of interest:

	Recently-married women.	All married women.
At ages 20 to 35 years.....	32.9%	20.6%
At ages 35 to 40 years.....	32.7%	14.7%
At ages 40 to 45 years.....	21.4%	5.9%

Inasmuch as we learn from this table that in the case of women aged 40 and upward, the newly-married exhibit a fertility of four times as great as that of married women in general, in whom pregnancy has already become rare, we can infer the influence upon fertility of abstinence and of artificial measures for the prevention of conception.

On the average, the maximum fertility of woman, that is, the maximum of effective fertility, is attained at the age of 18 to 20 years. Extreme youthfulness, and also the opposite condition, too advanced an age, when marriage is entered on, impair a woman's fertility; whereas the conditions most favourable to fertility are that, at the time of marriage, the uterus should have attained its fullest development, and the ovaries also should be completely mature; this is not usually the case at puberty, but rather at the age of 20, 21, or 22 years. In Austria-Hungary, of 100 marriages in which the wife's age at marriage was less than 18 years, the average offspring in the course of a single year were 36 to 38 children; in the case of 100 marriages in which the wife's age at marriage was 18 to 20 years, the average offspring in a year were 40; this being the maximum fertility, the number of offspring in a year per hundred marriages (i. e., the percentage fertility), now undergoes a regular decline as the wife's age at marriage increases; at an age of 25, the percentage fertility is 32; at the age of 30 years, the fertility is 24%; at the age of 35, 17%; at the age of 40 years barely 10%; at the age of 45, 7%; at ages 45 to 50, 0.1%. Thus, from the last figure, we see that of a thousand women marrying at the age of 50 years, one only gives birth to a child.

Men obtain their maximum fertility (i. e., procreative capacity) at the age of 25 or 26 years; at this age their fertility amounts to 35% (that is, of 100 marriages at this age, 35 children will on the average be born within a single year); at the age of 35 years, the percentage fertility of men falls to 23; at the age of 45 years, it is 9½%; at 55, 2.2%; at 65, ½% (*Körösi-Blaschko*):

Whereas hitherto we have considered only the monogenous fertility of married women, we must remember that the figures relating to their biogenous fertility are also of interest—that is to say, the changes which a woman's fertility experiences in married life in respect of the peculiarities of her husband; and of these peculiarities, the easiest to make the object of statistical investigation is the husband's age. The age of the husband exercises an important influence upon the fertility of the wife, as is proved by the following figures published by *Körösi*:

AGE OF THE FATHER.	AGE OF THE MOTHER.		
	25 years.	30 years.	35 years.
25 to 30 years.....	35.6%	25.0%	21.2%
30 to 35 years.....	31.2%	23.6%	19.9%
35 to 40 years.....	27.5%	21.8%	19.4%
40 to 45 years.....	.....	16.7%	14.0%
45 to 50 years.....	.....	14.4%	10.9%
50 to 55 years.....	.....	.....	10.9%

Also:

AGE OF THE MOTHER.	AGE OF THE FATHER.			
	25 years.	35 years.	45 years.	55 years.
Under 20 years.....	49.1%	.....	.....	.....
20 to 25 years.....	43.0%	31.3%	16.0%	.....
25 to 30 years.....	30.8%	27.3%	18.5%	.....
30 to 35 years.....	33.5%	23.7%	14.4%	8.1%
35 to 40 years.....	.....	18.9%	11.8%	6.7%
40 to 45 years.....	.....	6.6%	6.1%	3.0%

We learn from these figures that the maximum fertility is exhibited by a woman 18 years of age, when married to a man 25 years of age; less fertile is a woman 25 to 30 years of age married to a man 28 years of age; still less fertile is a woman 35 years of age married to a man 29 years of age. Neither the age of the

mother alone, nor that of the father alone, is determinative of the fertility of the marriage, for the fertility of young wives married to elderly husbands is quite different from that of young wives married to young husbands. Very various age-combinations are possible, and each exhibits an average fertility peculiar to itself.

We can also regard the question from the standpoint of the *difference* between the ages of husband and wife respectively. In this connection, *Körösi* is led by his tables to the conclusion that wives between the ages of 18 and 20 years attain their maximum fertility when married to men 7 years older than themselves; women of 25 years when married to men 3 years older than themselves; women of 29 years when married to men of the same age; women of 30 years and upward attain their maximum fertility only when married to men younger than themselves. Men, on the contrary, always attain their maximum fertility when married to women younger than themselves. The age of maximum fertility differs in the two sexes, and those marriages will be most fruitful in which husband and wife are each of the age most favorable to fertility. This will be the case when the age of the wife is 18 to 20 years, and that of the husband 24 to 26 or perhaps 29 years.

In connection with the question of fertility, we have also to take into consideration the vitality of the children born, that is, what proportion of those born survive. According to *Körösi's* interesting papers regarding the fertility of the inhabitants of Budapest, we learn that for every 100 marriages which have persisted for thirty years and upward, there were born, on the average, 539 children, of whom during this period 241 died, so that the percentage of survivals was 55.28. Parents who have lost one only of several children must, therefore regard themselves as exceptionally favoured by fortune.

Social position, occupation, and religion, have, according to the last-quoted author, a notable influence on fertility. His investigations showed that the Roman Catholics and the Jews exhibited the greatest fertility; among the Catholics there were 541 children, and among the Jews 557 children, per 100 marriages. Amongst 100 Protestant families, on the other hand, only 479 children had been born. It will be seen that the theory of the comparatively enormous fertility of the Jewish race is not supported by these statistics. The Jews do, however, exhibit a greater power of rearing children, for among them the marriages of more than 30 years' duration had 61 $\frac{2}{3}$ % of the children still living; among the Protestants 57 $\frac{3}{4}$ % survived; and among the Catholics only 52 $\frac{3}{5}$ %.

It thus appears that the surviving offspring per 100 marriages of 30 years' duration were, among the Catholics 278, among the Protestants 252, and among the Jews 349.

The question whether, and to what extent, the age of the parents has an influence on the vitality of the children, is answered by *Körösi's* mortality statistics in the sense that mothers below 20 years of age give birth to a larger proportion of children deficient in vital power. Where the mothers had married at the age of 16, the mortality of their offspring was, among Catholics 43%, among Jews 33%; married at 17, Catholic mortality 44%, Jewish 30%; married at 18, Catholic mortality 42%, Jewish 32%; married at 19, Catholic mortality 41%, Jewish 29%; married at 20, Catholic mortality 40%, Jewish 26%. Of the children whose fathers had married at the age of 24, 32% had died; of those whose fathers had married at 23, 37% had died; of those whose fathers had married at 20, 42% had died; and of those whose fathers had married before 20, actually 44% had died. It thus appears that the children alike of very young mothers and of very young fathers have a lessened chance of survival.

Inasmuch as the fertility of the wife is a product of two factors, her own peculiar fertility, and that of the procreating male, the question of the fertility of women cannot be accurately treated independently of this second consideration; hereby, however, is introduced a multiplicity of obscure combinations, by which the value of all the statistical data of fertility in women is seriously impaired.

These data give as the measure of fertility, the number of children per marriage actually brought up, embracing fruitful marriages, sterile marriages, and those not yet fruitful. In Berlin, in Copenhagen, and in Buda-Pesth, the average thus attained was slightly less than three births to each family, whilst the number of children actually living averaged two per family. A more accurate representation of fertility is obtained by ascertaining the number of children born, and the number of children living in relation to the duration of marriages reckoned in years, that is beginning with marriages of one year's duration, and proceeding year by year to the highest recorded duration of marriage. In this way interesting statistics have been obtained; for example, one who has completed thirty years of married life may count on the average that five or six children will have been born to him, but may also reckon on having buried two or three at least of these. (*Körösi.*)

Fertility is, as many facts indicate, also dependent on nutrition. A distinct proof, says *Spencer*, writing on the "Coincidence between high Nutrition and Genesis," that abundant nutriment increases the number of births, and vice versa, is found among the mammalia; compare, for instance, the litter of the dog with that of the wolf and the fox. Whilst the dog's litter numbers 6 to 14, that of the wolf numbers 5 to 7, that of the fox 4 to 6. The wild cat gives birth to 4 or 5 kittens once a year, the domesticated cat to 5 or 6, twice or thrice annually. The most remarkable contrast, in this respect, exists between the wild and the domesticated breeds of swine. The wild sow gives birth once a year to a litter of 4, 8, or 10 pigs (the number increasing in successive litters); the domesticated sow has often as many as 17 in a single litter, whilst in two years five litters, each numbering 10 pigs, are commonly born.

Darwin also draws attention to the fact that animals under domestication, being fed more abundantly and regularly than their wild allies, procreate at shorter intervals and are markedly more fertile than the latter. He states that the wild rabbit has four litters annually, each numbering 4 to 8 young; whereas the tame rabbit reproduces its kind six to seven times annually, and gives birth to litters numbering 4 to 11. Among birds, analogous phenomena are observed. The wild duck, for instance, lays 5 to 10 eggs in the course of the year, whereas the tame duck lays from 80 to 100; the wild grey goose lays 5 to 8 eggs, the domesticated goose 13 to 18.

It must be added that this exceptional fertility is manifested in animals that are quite inactive in comparison with their wild allies; not only are they richly fed, but they get their food without working for it. Moreover, it is easy to observe that among the domesticated mammals the well-fed are more fertile than the ill-fed.

That in the human species also, fertility is influenced to a notable degree by nutritive conditions, is shown by statistical investigation. After years distinguished by an exceptionally good harvest the number of children born is considerably greater than in normal conditions; whereas after a famine the opposite is observed. *Malthus's* law of population states, *inter alia*, that the population increases when the amount of available nutriment increases, that is, that favourable nutritive conditions cause an increase, that unfavourable nutritive conditions cause a decrease, of population. Hardships and exhausting occupations diminish the fertility of women. The remarkable fertility of the Kaffirs is referred to the

fact that this people, possessing large herds of cattle, lead a life comparatively free from care; it is no less true that the Boer women, who lead a life of well-fed leisure, have very large families; whereas the Hottentot women, poor, ill-nourished, and hard working, seldom bear more than three children.

Generally speaking, it may be said that fertility of the soil, in connection with an easily gained livelihood, favours also human fertility, notwithstanding the fact that certain statistical data seem to conflict with this proposition. *Sadler*, for instance, concludes that an increase in the price of the necessities of life does not *per se* check fertility, but, indeed, rather increases it; he considers that the apparent decline in fertility is due to the fact that the number of marriages diminishes, owing to the rise in prices. We must, however, point out, that an increase in price of the necessities of life is often associated with a rise in wages, and is therefore not necessarily identified with deficient nutrition; when, however, such a rise in prices leads to actual want, a limitation of fertility will certainly result; this has been proved by *Legoyt* and *Villermé* with regard to failure of the crops. Famine and disease lower the number of births; a less severe deficiency of nutriment often lowers only the quality of those born. *Malthus* was of opinion that the population of a country at any time was related to the quantity of nutriment produced or imported therein, on the one hand, and, on the other, to the liberality with which this nutriment was distributed to the individual. In countries where corn forms the principal crop, we find a thicker population than in pasture lands; and where rice is the principal crop, the population is even more abundant than it is in corn growing countries.

Passing to the consideration of the individual nutritive elements, we find that these also influence fertility. Above all, it has been proved that alcohol notably diminishes the fertility of women. *Lippich* states that of 100 women in Kärnten and Krain suffering from chronic alcoholism, 28.3 were barren. In England, where the abuse of alcoholic beverages is also very frequently observed in women, the same phenomenon has been noted. *Matthews Duncan* held that alcohol exercised a specific deleterious influence on fertility. Moreover, in addition to the constitutional disturbances produced by the abuse of alcohol, this beverage also exercises a well-known pathogenetic influence upon the female reproductive organs; with especial frequency, chronic oöphoritis may be shown to depend on this exciting cause.

A diet consisting mainly of fish is known to increase the sexual impulse, and is said also to increase fertility. Further, a diet consisting mainly of potatoes or rice is said to favour reproduction; compare, for instance, the fertility of the Hindoos, who abstain entirely from animal food, and of the Chinese, who live chiefly on rice. *Davy* maintained that the women of races living chiefly on fish were handsomer and more fertile than others: and *Montesquieu* suggested that there was an association between the abundant population of sea-ports and also of Japan and China, and the large quantity of fish consumed in those places. On the other hand, a diet consisting chiefly of meat is said to have an unfavourable influence in this direction; in support of this view it is pointed out that races living by the chase, and living therefore almost entirely on meat, have very small families. This generalization is invalidated by the fact that Englishwomen, who eat far more meat than the women of the Latin races, are nevertheless distinguished by their great fertility.

In his "History of Civilisation in England" *Buckle* writes: "The population of a country, although influenced by many other conditions, unquestionably rises and falls in proportion as the supply of nutriment is abundant or the reverse." *Herbert Spencer* also states that "every increment in the supply of nutriment is followed by an increment in fertility."

It must not be forgotten that, in addition to the more or less abundant supply of nutriment, there are always other influences affecting fertility; the general mode of life, race, climatic conditions, etc., may, in various ways, co-operate with or countervail the influence of nutritive conditions. If, with the best possible supply of nutriment, there is associated a luxurious and enervating mode of life, the abuse of alcohol, severe intellectual exertion, or sexual excesses, the general result will be a diminution in fertility. And it is easy to understand why *Cros*, although perhaps with little justification, goes so far as to regard easy circumstances as an active cause of depopulation. "It is the poor," he writes, "and the less wealthy departments of France, in which we find the most children." In estimating fertility, however, we must never fail to take into consideration the more extensive employment of means for the prevention of pregnancy among the upper classes of society.

To a certain extent we can trace the influence of climate and of season upon fertility. Heat appears to favour fertility; *Haycraft's* figures for the eight largest towns of Scotland show clearly how the number of conceptions rises and falls *pari passu* with the tem-

perature. Lower animals also, when brought from a colder to a warmer neighbourhood, exhibit an earlier and more frequently recurring "heat." In Europe, however, the Northern races appear more fertile than those of the south.

Of the seasons, spring is the one especially favourable to fertility. *Quetelet*, who proves by numerous statistical data that the maximum of conceptions occurs in May, attributes this fact to a general increase in the vital forces occurring in spring, after the cold of winter. *Villermé*, however, goes back to the older explanation, that the increase in the number of conceptions in May and June is due to social and economic conditions. The return of spring, especially the end of spring and the beginning of summer, a time of year in which the means of subsistence are provided in exceptional quantity, and of especially good quality, the season also of festivals and social reunion, when the two sexes are brought into more intimate contact and when the majority of marriages occur—these are the conditions associated with the season of greatest fertility. The figures of *Wappaeus* also confirm the influence of spring in favouring fertility. He found, however, that there were two seasons of maximal fertility. The first at the end of spring and the beginning of summer; the second in winter, especially in December. Mid-winter is for most people a period of domestic amusement and relaxation, one of exceptionally good nutrition, and of social reunion; the spring increase in fertility is a part of the awakening and increase of the reproductive forces of nature at large, which recurs every spring-time.

Every marked and sudden change in the mode of life has an unfavourable influence on fertility. *Darwin* reports that mares who have for some time been stall-fed with dry fodder and are then put out to grass are at first infertile after the change. Europeans going to reside in the tropics experience a notable decline in fertility as a result of the change of climate. According to *Virchow*, the fertility of European women who become acclimatized in the tropics declines very gradually, but in the course of a few generations is almost completely annulled.

The marriage of near kin is believed also to diminish fertility. As regards in-breeding in the lower animals, it is well known that when nearly related animals copulate, the number of the offspring is below the average. *Nathusius* paired a sow with its own uncle, the boar having proved productive in intercourse with other sows; the litter numbered five to six only. This sow, which belonged to the great Yorkshire race, was then paired with a small black boar,

which in intercourse with sows of its own variety had procreated litters numbering six or seven; as a result of her first pairing with the black boar, the sow cast a litter numbering twenty-one whilst the second attempt produced a litter of eighteen. Similar results were obtained by *Crampe*, in his experiments in the inbreeding of rats.

Some authorities declare that the results of in-breeding are similar in the human species, that the marriages of near kin are less fruitful than the average. *Darwin* writes in this connection: "With regard to human beings, the question whether breeding in-and-in is also deleterious, will probably never receive a direct answer, for man reproduces his kind so very slowly, and cannot be made the object of experiment. The very general disinclination of nearly all races to the marriage of near kin, which has existed from the very earliest times, is of weight in relation to this question. Indeed we appear almost justified in applying to the human race the experience gained by experiment on the higher mammals."

Darwin's assumption regarding the effect upon fertility of the marriage of near kin in the human species, cannot, however, be accepted without qualification. In ancient times there was no uniformity of opinion on this topic. It is well known that among the Phœnicians, a son might marry his mother, and a father his daughter; and among the ancient Arabs it was the legal duty of the son to marry his widowed mother. Moses, on the contrary, forbade marriages between parents and children, between brothers and sisters, also marriage with a father's sister, with a wife's mother, and with an uncle's widow.

Darwin considered that the marriage of first cousins was not unfavourable to fertility. Of 97 such marriages, 14 were sterile, whilst of 217 marriages of those not akin, 35 were sterile; the percentage in both cases being almost identical. *Mantegazza*, who regards kinship in marriage as unfavourable to fertility, found nevertheless that among 512 marriages of near kin, only 8 to 9% were sterile. It is widely believed that the dying out of many aristocratic families is dependent on the in-breeding so common in this class—but it must be admitted that scientific evidence in support of this belief is lacking. Incest in the human species may certainly result in fertilization. Among the Jews, marriages of near kin are very common, and often prove extremely fruitful.

Göhlert made a statistical investigation of the fertility of the reigning families of Europe, in order to throw light on this question. In the Capet dynasty, 118 marriages of near kin took place, and of

these 41 were sterile; in the Wettin dynasty (Saxony), there were 28 such marriages, of which 7 were sterile, and 1 produced one child only; in the Wittelsbach dynasty (Bavaria), 29 such marriages, of which 9 were sterile, and 3 produced only one child each. Thus of 175 marriages of near kin, 57, or 32.6% remained sterile. Further, in the Habsburg-Lothringen dynasty, of 110 marriages, 25 were marriages of near kin, and of these 33% remained sterile.

It has been assumed since the days of antiquity that temperament and constitution exercise some influence on fertility. *Hippocrates*, *Soranus*, and *Diokles*, are among the ancient authors who refer to this matter. *Soranus* says very justly: "Since most marriages are contracted, not from love, but for the procreation of children, it is irrational, when choosing a wife, to have regard, not to her probable fruitfulness, but instead of this to the social position and the wealth of her parents."

It would appear that a certain dissimilarity in physical constitution and temperament between husband and wife is favourable to the fertility of the marriage. For instance, a vivacious, dark husband, and a lethargic, fair wife, are better suited to one another than a husband and wife both extremely active, or both of extremely phlegmatic temperament.

Toussaint Loua published the following figures regarding the fertility of the women of the various countries of Europe:

COUNTRY.	Number of births per hundred inhabitants.	FERTILITY OF WOMEN BETWEEN THE AGES OF 15 AND 45 YEARS.		
		Married.	Unmarried.	Average.
Hungary.....	4.94	.....	.....	17.8
Russia.....	4.12	.....	.....	20.5
Austria.....	3.93	.....	.....	16.4
Germany.....	3.77	34.8	2.9	17.7
Italy.....	3.67	28.8	2.4	16.1
Holland.....	3.67	35.3	1.0	16.0
Finland.....	3.63	.....	.....	15.8
England.....	3.58	29.7	1.6	15.5
Scotland.....	3.53	32.8	2.5	15.8
Belgium.....	3.25	33.7	1.8	14.8
Denmark.....	3.12	28.5	2.8	14.4
Roumania.....	3.12	.....	.....	13.5
Norway.....	3.10	29.3	2.2	14.0
Sweden.....	3.05	29.1	2.5	13.7
Switzerland.....	3.04	29.7	1.1	13.1
Greece.....	2.96	.....	.....	13.2
Ireland.....	2.69	29.8	0.5	12.3
France.....	2.63	20.3	1.8	11.6

In towns, conjugal fertility is less, extra-conjugal fertility greater, than in the country. An increase in factory-labour gives rise to an increase in the population, but to a decline in the vitality of the offspring; that is to say, it causes a quantitative increase, and a qualitative decrease, in fertility. An increase in agricultural labour has precisely the opposite effect. The influence of war upon fertility is unfavourable both quantitatively, and qualitatively. According to *Tschouriloff*, the introduction of universal military service, by withdrawing for a time all the most vigorous men from domestic life, tends to diminish fertility. Extensive emigration from a country in which the soil is fertile, and where the vital conditions are generally favourable, is stated by *Bertillon* to cause an increased fertility in the mother country; he further states that an increase in the number of the proprietors of the soil is followed by diminished fertility, and *vice versa*.

Prostitutes show as a rule a very low fertility. According to the data of *Tarnowskaja*, the fertility of prostitutes in Russia is 34%, whilst married women of similar ages in Russia exhibit a fertility of 51.8%. *Gurricri* found 60% of prostitutes childless.

The fertility of female criminals was found by *Lombroso* to be undiminished. On the average, poisoners had given birth to 4.5 children, other murderesses to 3.2 children, child-murderesses to 2 children; thus the prisoners whose crime is commonly dependent on an abnormal eroticism had a fertility above the average.

The diminished fertility of prostitutes depends in part upon frequent venereal infection, in part upon the unfavourable influence of the mercury and iodide of potassium administered for the cure of such infection, also upon the frequency with which they consume excessive quantities of alcohol, upon the excessive frequency of coitus, which exercises a traumatic influence, upon the irregular mode of life, and upon their disinclination to be burdened with children.

Conjugal fertility, that is to say, the ratio between legitimate births and the number of married women between the ages of 15 and 50 years, has declined in Germany during the last decades. It was:

During the years 1872 to 1875.....	29.7%
During the years 1879 to 1882.....	27.4%
During the years 1886 to 1892.....	26.5%

This decline is small, but it is much more manifest in urban than in rural districts. This fact is shown by the following figures, relating to fertility in Prussia:

	1872 to 1879.	1894 to 1897.
In all towns.....	26.9	24.0
In Berlin.....	23.8	16.9
In other large towns.....	26.7	23.5
In rural districts.....	28.8	29.0

This difference depends principally on the fact that in the large towns of Germany (and still more in those of France) the use of means for the prevention of pregnancy is continually increasing, whereas the population of the rural districts is as yet less familiar with the use of these measures.

According to *Hellstenius*, conjugal fertility, that is, the number of children per married couple, is as follows:

In the Netherlands.....	4.88
Norway.....	4.70
Prussia.....	4.60
Bavaria.....	4.55
Sweden.....	4.52
Saxony.....	4.35
England.....	4.33
Belgium.....	4.23
Denmark.....	4.18
France.....	3.46

Tallquist, who has published a statistical investigation concerning the modern tendency to diminished fertility, arrives at lower figures than *Hellstenius*. According to him, conjugal fertility is:

In Prussia.....	4.11
England.....	4.10
Belgium.....	4.12
France.....	2.09
In various States of the American Union.....	2.5 to 3.0

From the *Almanach de Gotha Vacher* obtained figures showing that each family of the higher aristocracy has on the average the following number of children.

In France.....	2.0
Italy.....	3.0
Germany.....	4.8
England.....	4.9
Russia.....	5.1

According to the figures we have published, the fertility of women suffices for the production during the sexual life of a small number

only of children, averaging, in fact, 4 to 5 children per marriage. Many mothers, however, give birth to a very large number of children. Among 73,000 families inhabiting Buda-Pesth, *Körösi* found 300 mothers who had had 15 children or more; 7 mothers who had each had 21 children; and 3 mothers who had given birth respectively to 22, 23 and 24 children.

A newspaper report states that the wife of a citizen of Buda-Pesth, during the 43 years of her married life, gave birth to 32 children. In the year 1902, a Bohemian woman gave birth to her twenty-fourth child. *Stieda* reports the cases of two mothers, one of whom had 21, and the other 23 children. The wife of the German Emperor, Albrecht I, and the wife of Prince Jost of Lippe-Biesterfeld, each bore 21 children.

The so-called *two-children-system* obtains most commonly in France.

It is true that even in France there are on an average nearly three children born per marriage; but if we take into account surviving children only we find an average per family of 2.1 children only. Similar conditions obtain in New England, and in Transylvania; and the same practice is spreading throughout the United States. Another way in which the attempt is made to keep down the population is that customary in Alsace, where, if there are several children in a family one only marries, in order to avoid a division of the family property. It cannot be denied that in France, doubtless in consequence of the two-children system, a somewhat widely diffused prosperity exists, a prosperity which is lacking in the rare districts in France, such as Brittany, in which limitation of the family is not practised. What a disastrous influence the general use of measures for the prevention of pregnancy exercises on the military power and political status of a nation has, however, in recent years been made especially manifest in the case of France. In that country, of ten million families, two million are absolutely childless, and two million have only one child each, so that two-fifths of the French families are as good as inactive in maintaining the population of the country. The injury thus done to France is shown still more clearly by a tabular comparison of the excess of births over deaths in the German and French nations, respectively, during the two decades 1874 to 1894 (from *G. von Mayr's Population Statistics*).

Year.	Germany.	France.
1874.....	+13.4	+4.8
1875.....	13.0	2.9
1876.....	14.6	3.6
1877.....	13.6	3.9
1878.....	12.7	2.6
1879.....	13.3	2.5
1880.....	11.6	1.7
1881.....	11.5	2.9
1882.....	11.5	2.6
1883.....	11.7	2.6
1884.....	11.2	2.3
1885.....	11.3	1.4
1886.....	10.8	1.5
1887.....	12.7	1.3
1888.....	12.9	2.5
1889.....	12.7	1.2
1890.....	11.3	—0.3
1891.....	13.6	—0.5
1892.....	11.7	+0.1
1893.....	12.2	—1.2
1894.....	13.6	—0.4

To what an extent in all times, and among all peoples, the fertility of women was esteemed, is shown by religious writings and traditional customs which aimed at enabling a wife who had had no children by her own husband, to seek other conjugal embraces. Among the Jews, it was the duty of a man to marry his widowed and childless sister-in-law; if he were unwilling or unable to perform this duty he was compelled to take a part in a ritual termed "chaliza," in which his foot was bared and the bereaved woman spat upon him, because he was unwilling to maintain his brother's house. In the law book of the Hindoos of *Manus*, we read, "If husband and wife have no children, it is proper for them to obtain the desired offspring by a union between the wife and the husband's brother, or some other relative;" the child obtained in this way was legally regarded as the child of the husband. *Confucius* wrote: "If your wife is barren, take a second wife; she must be subordinate to the first wife, for her only duty is the bearing of children." An analogy to this ordinance is to be found in the Bible; Abraham's barren wife Sarai says to Abraham: "Behold now, the Lord has restrained me from bearing: I pray thee, go in unto my maid; it may be that I may obtain children by her. And Abraham hearkened unto the voice of Sarai." In the same way the barren Rachel speaks to her husband Jacob, "Behold my maid Billah, go in unto her; and she shall bear upon my knees, that I may also have children by her."

Luther, in his treatise on marital love published in the year 1522, bases, doubtless on the above biblical precedents, the following state-

ment regarding fertility: "If a sexually potent woman is married to an impotent man, if she is unable to take any other man openly, yet is unwilling to do anything dishonourable, she should say to her husband, 'Dear husband, you cannot fulfil your duty to me, and you have deceived my young body, you have endangered my honour and my happiness, and in the eye of God our marriage is null, forgive me therefore if I form a secret union with your brother or with your nearest friend; the fruit of this union will be yours in name, thus your possessions will not fall to strangers, and you will willingly allow me to deceive you, because involuntarily you have deceived me.'"

In ethnography, the term *endogamy* is used to denote a law or custom by which marriage is allowed only within the limits of a specified race, tribe, or caste; thus, in the Old Testament, Jews are forbidden to marry women of other races. The ethnographical term *exogamy* indicates the prohibition of marriage between persons who are more closely allied, as, for instance, the Mosaic prohibition of marriage within certain degrees of blood-relationship. Such exogamic prohibitions persist even in the legislation of the present day. In many ecclesiastical and national laws we find the marriage of first cousins and of uncle or aunt with niece or nephew forbidden; and even a prohibition of the marriage of a man with his deceased wife's sister.

Hegar considers the danger of inbreeding to be very great in the human species; for whereas in the lower animals breeders employ a methodical and carefully considered selection of the best specimens, nothing of this kind occurs among human beings; and the health of modern civilized man is such that there are few families without a skeleton in the closet. "Not only in families, but also in villages, in small and large towns, even in classes, and in entire nations, certain peculiar qualities, morbid tendencies, and predispositions, are handed down from generation to generation. We have, for instance, the tendency of the Jews to nervous disorders and diabetes, that of the English to gout, that of the Germans to myopia." *Strahan* has therefore employed the term "social consanguinity," to indicate that by means of common customs, environment, occupation, and mode of nutrition, a similarity in type is produced, leading to a similar predisposition to disorders and diseases transmissible from father to son.

The dangers of inbreeding are believed by *Hegar* to be, under present-day conditions, so considerable that he would allow the mar-

riage of near kin in exceptional cases only, and where the circumstances are peculiarly favourable — for instance, where both parties to the projected marriage are in excellent health, and where there is no great similarity between them in feature or mental type. Certain anomalies transmitted from remote ancestors, dependent on deeply-marked peculiarities of the germ cells, may be so developed by inbreeding as to become absolutely fixed characteristics. If the morbid manifestations can be traced back for several generations, if the bodily defects and disturbances of development (the so-called stigmata of degeneration), are well marked and numerous, if the functional disorders of the nervous system and of the sense organs are pronounced, leading to idiocy, insanity, epilepsy, congenital deaf-mutism, blindness, instinctive criminality,—there is in such cases little or no hope of the regeneration of the family. It dies out, because the members are sterile; because they are confined in prisons or asylums; or because the children, if any are born, are deficient in vitality, and fail to reach maturity.

According to the brief summary of the subject given by *Hegar*, the peculiarities of the offspring at the time of birth depend upon:

Factors which give rise to peculiarities of the germ-cells:

- I. Germinal rudiments derived from the ancestors;
- II. Influences acting on the germ-cells within the parent organism;
 - a. Owing to peculiarities of the fluids and tissues of the parental body;
 - b. Owing to substances which penetrate the parental body and reach the germ.

Germinal rudiments altered by the conjugation of the male and female reproductive cells:

- I. On the mother's side;
 - a. Owing to peculiarities of the fluids and tissues of the maternal body;
 - b. Owing to substances which penetrate the maternal organism and reach the fertilized ovum.
- II. On the father's side, owing to substances which adhere to the paternal reproductive cells, or are enclosed within these.

The number of consanguineous marriages at the present day is not less than $5\frac{1}{2}$ to $6\frac{1}{2}$ per 1,000; the fertility of these marriages appears to be identical with the fertility of ordinary marriages. *Mayet* has made a statistical investigation to determine the influence

of consanguineous marriages in the pathogenesis of mental disease. He finds that the number of those congenitally affected with mental disorder is twice as great in the offspring of consanguineous marriages as in the offspring of crossed marriages; in the case of simple mental disorder, of paralytic dementia, and of epileptic dementia, the ratio is actually greater than two to one (the actual figures are 218, 257, 208: 100). Thus we see that when there exists any cause of inheritable mental disorder, blood-relationship of the parents more than doubles the danger to the children. In the case of imbecility and idiocy the danger is less in this respect (the ratio is 150: 100); the factor of inheritance plays a less prominent part than in the case of other psychoses.

It was remarkable that among the offspring of marriages of nephew and aunt, cases of mental disorder were almost entirely lacking. Among the offspring of marriages of uncle and niece, the inheritance of mental disorder was more prominent than among the children of first cousins. It is interesting to determine the influence of blood-relationship in cases in which the existence of inheritable predisposition could not be proved. In these cases, as regards simple insanity, paralytic dementia, and epileptic dementia, the number of cases among the offspring of consanguineous marriages was only one-half as compared with the offspring of crossed marriages; whereas in the case of imbecility and idiocy this ratio was reversed. In idiocy, where inheritance generally speaking plays a small part, the origination of the disease would often appear to depend directly on the blood-relationship of the parents; whilst as regards other forms of mental disorder, if there is no inheritable predisposition, blood relationship in the parents appears to be a positive advantage; where, however, a family predisposition to insanity exists the likelihood of actual insanity appearing in the offspring is notably enhanced by a consanguineous marriage.

As we have already pointed out, a restriction of the fertility of women occurs in the majority of marriages, to this extent, that the potential reproductive powers of the wife are not fully utilized. In recent times, however, the restriction of fertility, by the deliberate use of measures for the prevention of pregnancy, has become so widely diffused, that it appears unwise from the scientific stand-

point simply to ignore the question, and it has become indispensable to study how the practice developed, and to consider what are its actual results. From our own point of view, it is the more necessary to do this, for the reason that the use of preventive measures has come to play an important part in the sexual life of woman, and therefore deserves the fullest attention, not merely from the standpoint of the sociologist, but in addition from the purely medical point of view.

In many divisions of the population, and even in entire nationalities, the prevention of pregnancy, not merely in illicit intercourse, but also in married life, has become so general a practice that the fertility of the nation as a whole has been profoundly modified. Thus, in France at the present day, the average number of children per marriage is less than two; and the two-children-system is almost universally practised in Transylvania and Norway, whilst it is very rapidly spreading in North America. In the principal towns of the whole of Europe, this system is largely on the increase among the upper classes of society. The marriages of the poor, partly owing to ignorance, and partly to indolence, are as yet comparatively little affected by this depopulative principle.

In the days of antiquity, many lawgivers endeavoured to set bounds to excessive fertility, and artificial abortion was methodically practised by those who wished to avoid an inconveniently large family. Even among savage peoples, we find that certain preventive measures are occasionally employed in sexual intercourse. Among civilized peoples, however, until the beginning of the nineteenth century, religious and moral ideas derived from the Bible continued to dominate the sexual life. It is well known that Old Testament law and Christian morality alike forbid any artificial restriction of human increase. "Increase and multiply" was the command given in Genesis to the first parents of the race; and the psalmist exclaims, "Happy is the man that hath his quiver full" of children.

A remarkable revolution in thought was initiated toward the beginning of the nineteenth century by the great philanthropist and powerful thinker, *Thomas Robert Malthus*, founder of the doctrine of the propriety of checking the increase of population, author of the work "An Essay on the Principle of Population," London, 1798, whose Law of Population soon attracted world-wide attention. Modern civilization having greatly increased the cost of bringing up a family, while simultaneously there has been a general

rise in the price of the necessities of life, there has resulted an extraordinary diffusion of Malthusianism; in comparison with the causes just alluded to for the use of preventive measures, diseases which render renewal of pregnancy dangerous to the mother's life have comparatively little to do with the causation of voluntary sterility.

In his "Essay on the Principle of Population," *Malthus* indicates, as the cause which has hitherto hindered mankind in the pursuit of happiness, the unceasing tendency of all organic life to increase in excess of the means of subsistence. In the case of plants and of unreasoning animals, the natural process is a very simple one. Both animals and plants are impelled by a powerful instinct to reproduce their kind, and the operation of this instinct is quite undisturbed by any anxiety regarding the livelihood of their offspring. The reproductive function is thus exercised at every available opportunity, and the superfluous individuals of the next generation are destroyed by lack of space and nutriment. In the human species the restriction of population is effected by a more complex mode of operation. Man is impelled to reproduce his kind by an instinct not less powerful than that of other animals; but the gratification of this instinct is checked by reason, which makes him ask himself whether he is not about to bring into the world beings for whom he will be unable to provide the means of subsistence. If he is influenced by this consideration, the resulting restriction of population may often entail serious consequences; if, on the other hand, he gratifies his instinct, regardless of the appeal of reason, the human species will inevitably tend to increase more rapidly than the means of subsistence.

Malthus declared that population, when its increase was unrestricted, doubled itself every twenty-five years, and therefore increased in a geometrical progression; he considered that in the most favourable circumstances the means of subsistence could not possibly increase more rapidly than in an arithmetical progression. The contrast between these two modes of increase will be more striking if we write out the actual figures. According to the theory of *Malthus*, the increase of human population would be represented by the figures 1, 2, 4, 8, 16, 32, 64, 128, 256, whereas the simultaneous increase in the means of subsistence would be represented by the figures 1, 2, 3, 4, 5, 6, 7, 8, 9. Such an increase in population is, however, always prevented by certain checks, classed by *Malthus* as of two kinds, preventive checks and positive checks.

A preventive check, in so far as it is voluntary, is peculiar to the human species, and originates in the intellectual faculty which enables man to foresee the consequences of his actions. A man who looks around him, and sees the poverty into which those with large families so often fall, who reckons up his present property or earnings, which barely suffice to provide for his own personal necessities, cannot fail, when he considers how hardly they would suffice for seven or eight additional persons, to doubt whether it would be possible for him to provide for the offspring he might bring into the world. Such considerations as these are likely to lead a large number of persons of all civilized nations to resist their natural instincts, and to refrain from early marriage. If abstinence entailed no serious consequences, it would be the least of all evils resulting from the principle of population.

The positive checks to increase of population are manifold, and embrace all the causes which are competent to lessen the natural duration of human life. Among these we may enumerate: all unhealthy occupations, severe toil, climatic conditions, poverty, errors in the rearing of children, town life, excesses of all kinds, the whole army of illnesses and epidemics, war, pestilence, and famine. In all countries, preventive and positive checks are more or less powerfully operative, and yet there are few in which the population is not continually tending to increase beyond the means of subsistence. As a further consequence of this tendency of population to increase, we observe the wider diffusion of poverty among the lower classes, so that any permanent improvement in their condition is rendered impossible.

After *Malthus* had carefully stated his thesis, he gave a summary record of the conditions of population in nearly all nations of the past and of his own time, in order to show how in all alike the three principal means of limiting population, moral restraint, disease, and poverty, had been in continuous operation.

He showed, for instance, how the population of the South Sea Islands had been limited by certain conditions, cannibalism, castration of the males, infibulation of the females, late marriages, the sanctification of virginity, contempt for marriage, etc.

In ancient Greece, Solon's laws permitted infanticide. *Plato*, in "The Republic" asserts that it is the duty of the Government to regulate the number of the citizens, and to prevent an immoderate increase; men and women should be allowed to procreate only during their period of maximum strength, all weakly children should be

killed. *Aristotle* advised that men should not be allowed to marry before the age of 37, and women before the age of 18; the women should give birth to a limited number of children only; if, after this, they again became pregnant, abortion should be induced. He maintained that if all were at liberty, as was the case in most countries, to bring into the world as many children as they pleased, poverty, the mother of crime and insurrection, must inevitably ensue.

Among the Romans war was as a positive check unceasingly operative: in this time of the Empire, preventive methods came into general use, in the form of various kinds of sexual perversity. *Juvenal* complains of the skilled methods employed in the induction of abortion; during the later period of the Roman Empire, sexual morality became so degenerate that marriage was hated and despised.

Passing to the consideration of the checks on population among the nations of modern Europe, *Malthus* examined the registers of marriages and deaths, and came to the conclusion that in few countries is the mass of people sufficiently capable of self-restraint to postpone marriage until they are reasonably assured of being able to provide for all the children they are likely to have; still, he ascertained that at the present day positive checks on population were less active, and preventive checks more active, than in earlier times and among savage races.

Malthus did not base upon his conclusions the advice that in sexual intercourse means of preventing pregnancy should be employed, as the modern "Malthusians" advise; in his eyes, moral restraint, that is to say, sexual abstinence, was the only remedy for the prevention of poverty and the other evil consequences of the principle of population. Moral restraint was in his opinion the only virtuous method of avoiding the evils of excessive fertility. It is a man's duty not to marry until he had a definite prospect of being able to maintain his children; the interval between puberty and marriage must be passed in strict chastity. Man's duty is not the mere reproduction of his species, but the reproduction of virtue and happiness, and if he is not able to do the latter, he has no right whatever to do the former. *Malthus* lays great stress on educating the people in this matter; "in addition to the ordinary subjects of instruction, it is necessary to explain the principle of population, and the manner in which it gives rise to poverty." In the nature of the case, no lasting and general improvement in the condition of the poor is possible without an increase in the preventive restriction of population.

The *Malthusian* doctrine of the law of population gave rise to an enormous sensation, and some of his disciples soon proceeded to translate his conclusions into practice; such authorities as *James Mill* and *Francis Place* recommended measures by means of which, "without any injury to health, or to the feminine sense of delicacy, conception can be prevented:" the avowed aim of these measures was to prevent the increase of population beyond the means of subsistence. Physicians and physiologists joined the ranks of these innovators; among others *Raciborski*, *Robert Dale Owen* in his "Moral Physiology," *Richard Carlile* in his "Book of Woman," the first work to give an exact description of the means to employ for the prevention of conception, *Knowlton* in his "Fruits of Philosophy." In the year 1827 in the Northern counties of England leaflets were for the first time distributed among the working classes to instruct them in the use of preventive measures. *Bradlaugh* founded the Malthusian Society, which aimed at the dissemination of instruction in the use of preventive methods. There is now in England a "Malthusian League," numbering leading physicians among its members; this supplies to all classes the means by which the family can be artificially limited. A new edition of the above-mentioned book, "The Fruits of Philosophy," was circulated in London in an edition of several hundred thousand copies, and prominent persons spoke at congresses on the subject of Neo-Malthusianism. In Germany, also, a "Union of Social Harmony" was founded, for the free distribution of a hand-book on the use of measures for the prevention of conception, and for an investigation regarding the results of these.

We do not propose here to subject the teaching of *Malthus* to a critical examination; he has found formidable opponents, who have endeavoured to prove that his fundamental assumption is false; they maintain that work or the power of work increases in direct ratio with the population; and they also assert that population tends to increase, not, as *Malthus* maintained, in a geometrical, but simply in an arithmetical progression. We shall merely quote *Liebig's* reply to the law of Malthus, "when human labour and manure are provided in sufficient quantity, the soil is inexhaustible, and will continue to yield unceasingly, the most abundant harvests;" and *Rodbertus'* remark that "agricultural chemistry will ultimately be competent to create nutritive materials; this will some day be just as much within the power of society, as it is at present to provide any requisite quantity of textiles, given the

necessary amount of raw material." The celebrated socialist *Bebel*, is a strong opponent of *Malthus*. He writes: "The earth is doubtless thickly populated, but none the less only a small fraction of its surface is occupied and utilized. Not merely could Great Britain produce, as has been proved, a far larger supply of nutritive materials than at present, but the same is true of France, Germany and Austria, and in a still higher degree of the other countries of Europe. European Russia, were it as thickly populated as Germany, could support, instead of ninety millions, as at present, a population of four hundred and seventy-five millions. For the purposes of the higher civilization, toward which we are striving, we have to-day in Europe, and shall have for a long time to come, not an excess of population, but an insufficiency, and every day brings new discoveries and inventions whereby the means of subsistence are potentially increased. In other parts of the world, the insufficiency of population and the superfluity of ground are even more noticeable. *Carey* is of opinion that the single valley of the Orinoco, fifteen hundred miles in length, would suffice to provide nutritive material in sufficient quantities to feed the whole existing population of the world. Central and South America, and more especially Brazil, have a soil of extraordinary fertility, but are as yet practically unutilized by the world. To increase, not to diminish, the numbers of the human race, that is the appeal made by civilization to mankind!" A similar position on this question was recently taken by Roosevelt, the President of the United States, himself the father of six children, in a letter to two American women, *Mrs. J. and M. Van Vorst*, authors of the book "*Woman Who Toils (Factory Life in America)*." In this book, the writers prove that in the United States the average size of the family is now less than in any other country of the world, France alone excepted. President Roosevelt, in his letter, declares himself an ardent supporter of the biblical injunction, "increase and multiply!" He writes: "Whoever evades his responsibilities, through desire for independence, convenience, and luxury, commits a crime against the race to which he belongs, and should be an object of contempt and horror to a healthy nation. When men avoid becoming fathers of families, and when women cease to regard motherhood as the most important career open to them, the nation to which these men and women belong has cause for uneasiness about its future." President Roosevelt continues: "To the American woman marriage is no longer a life-duty, a profession, as it is to her sisters

who are members of the older civilizations. A woman who manages an extensive business, who supervises her own landed property, or who plays her own part in the world of finance,—for such as these, the ‘lottery of marriage’ is naturally something they dread rather than desire.” President Elliott, of Harvard College, has expressed similar views in a speech on this subject. He deplures the late marriages and small families of the cultured Americans. According to the last census, an American family has on the average less than three children; twenty years ago the average number was from four to five children.

I pass now to consider the medical point of view of this question of the prevention of pregnancy. It is my opinion that the physician as such should intervene in the matter, not in any case for the relief of the dominant economic parental dread of insufficient means for the upbringing of children, but only on account of the purely medical consideration of the physical dangers of motherhood. That is to say, the physician should lend his skilled assistance toward the attainment of facultative sterility, only when his own special scientific knowledge leads him to consider this urgently necessary; it is not his province to assist in preventing the birth of an immoderate number of offspring; his intervention is justified only when deliberate reflection has convinced him that his patient’s health or life would be endangered by pregnancy or child-birth. A woman’s life and well-being must appear to him of greater importance than the existence or non-existence of a possible infant. That this view is morally sound, is shown by the fact that public opinion justifies the accoucheur in the destruction of an already living child, when the mother’s life is endangered. In this connection we may recall the words of the great Napoleon; the physician Dubois, attending Marie Louise in a difficult confinement, asked Napoleon whether, if matters came to an extremity, he should save the mother or the child; Napoleon, notwithstanding his strong desire for the birth of an heir to his dynasty, replied, “The mother, it is her right.”

In isolated cases, which deserve always very serious consideration, some pathological condition in the wife may justify the prevention of pregnancy. In certain very serious general disorders, in diseases of the heart or of the lungs, in pelvic deformity, and in pathological changes of the female reproductive organs, it may be right to employ means for the prevention of pregnancy—not merely sexual abstinence, but actual measures to prevent fertilization.

The misuse of medical knowledge for the recommendation or employment of preventive measures, on the ground of humanitarian

sentiment or social and economic considerations, must, however, be strongly resisted. Even leading gynecologists have erred in this way. *Sänger* writes, "Scientifically-trained accoucheurs will do much more to promote the health and well-being of women, and to protect them from sexual and other diseases, than the humanitarian efforts of the Neo-Malthusians, who transfer a purely scientific question, such as the disproportion between the number of births and the supply of nutritive material, to the sphere of medicine, regarding themselves as justified in preventing conception whenever they please, independently of considerations relating to the health of the mother * * * * *

A woman exhausted by frequent child-bearing, anæmic and suffering, is certainly a figure to arouse everyone's sympathy; in so far as she is ill in consequence of injury received in child-birth, it is our duty to prevent further injury, and to relieve to the best of our ability that which has already occurred; in so far, however, as she is not suffering from any affection of the reproductive organs, but is ill owing to the lack of sufficient food, or from overwork, it is the duty of society to render assistance. Here we have to do with the social problem; the solution of which will be brought no nearer by the use of the occlusive pessary." *Fehling* also maintained that a text-book of gynecology is not the proper place in which to pass judgment on so important a socio-political question. The business of the gynecologist in this matter is merely to say a word of caution against the use of various measures which are so often recommended as harmless, but are in fact dangerous to the woman who uses them.

Kleinwächter, who declares that he is far from recommending the use of preventive measures when a healthy woman wishes to save herself the trouble of child-bearing, gives as legitimate indications for their use: 1, the various forms of severe pelvic deformity; 2, certain tumours in the pelvic cavity; 3, after the removal of malignant tumours of the reproductive organs, certain general disorders, recently arrested pulmonary tuberculosis, organic heart disease, etc. Regarding these cases, *Kleinwächter* writes: "The wife's life would be endangered by pregnancy, which must therefore be prevented without forbidding coitus, and avoiding the practice of coitus interruptus, which endangers her health, or of any mode of intercourse repugnant to the feelings of wife or husband."

The most trustworthy, but unquestionably at the same time the least practicable method, for the prevention of pregnancy, is that of

Malthus—permanent sexual continence. This recommendation, to which *Tolstoi* in "The Kreuzer Sonata" gives his adhesion, has recently found an advocate in a modified sense in a distinguished gynecologist, *Hegar*, who considers that the great fertility of the modern civilized countries of Europe entails many disadvantages—inferior physical development, increased general mortality, emigration, an unfavourable distribution of population in relation to dwelling and occupation, occasional famine—and who sees the only effective remedy in a "regulation of reproduction," whereby the tendency to marriage and the number of births are to be diminished. The question "when is the number of children in a family too large?" is answered by *Hegar* as follows "A maximal limit is easy to establish. The most suitable age for child-bearing is from twenty to forty. At an earlier and a later age than this, both the mother and the offspring are liable to suffer. Between two successive births there should be an interval of about two and a half years; this would leave time for the birth of eight children. If we assume that pregnancy lasts nine months, that lactation is continued from nine to twelve months after delivery, (and if the mother does not herself nurse the child, artificial feeding or careful supervision of the wet-nurse will occupy her for a like period), to devote an additional period of six months to nine months to the complete restoration of the mother's health cannot be regarded as excessive. For this maximum family we assume a perfect state of health on the part of the mother, a pure atmosphere, and a sufficient supply of all the necessities of life. Illnesses, weakness, or infirmity of the mother, often indicate that the number of children should be further limited. It is easier to provide a suitable dwelling and a pure atmosphere for a small family than for a large one. The same thing is true as regards the means of subsistence.

"If the reproductive function is to be intelligently controlled," continues *Hegar*, "above all it is necessary to devote attention to the age and health of the parents; but occupation, dwelling, and general environment, must also not be overlooked. Among the cultured classes of our Fatherland, people are gradually learning to form sound opinions about these matters. Among the working classes, on the other hand, especially among those engaged in factory labour, the heedless gratification of the sexual impulse is responsible for untold misery." *Hegar's* advice may be summarized as follows: If the marriage takes place after the attainment of complete maturity, in the wife at twenty and in the husband at twenty-five,

and if procreation is discontinued in the wife at forty and in the husband at forty-five to fifty, if between successive deliveries the intervals necessary for the wife's restoration to health are maintained, if illness and states of debility are taken into account, if sickly, hereditarily-tainted individuals are forbidden to marry — the excessive increase in population, as far as Germany is concerned, will cease to give cause for anxiety. The regulation of reproduction will, however, still be incomplete, unless we enforce a selection too rigorous for our present views. Moderation and continence must aid as far as may be necessary in preventing an undue increase in population. *Hegar* does not fail to point out the evil effects of an excessive limitation of the family. In a marriage when one child only is born, this child is the object of unceasing anxiety and attention, and real or imaginary dangers assume an excessive importance in the morbidly excited imagination of the parents. Hence we find a continuous excess of watchfulness and over-education in the case of the only child, to whom independent thought and action are entirely unknown. Boys become milksops, girls nervous and hysterical. In the two-children-system, again, one or both of the children may die when the age of the parents is already considerably advanced. Still in those districts of France in which this system obtains the population is well-to-do, and an exceptionally large proportion of the males are fit for military service. The use of various measures for the prevention of conception is considered by *Hegar* to be harmful, at any rate in the case of young women; this practice gives rise to anæmic conditions, and to nervous weakness and irritability, seldom, however, to more serious disorders, as indeed is apparent from the fact that the mortality of married women as compared with unmarried women is lower in France than in other countries.

Gräfe, with reference to the view that if for any reason conception must be prevented, this should be done by abstinence from sexual intercourse, remarks: "Doubtless an ideal demand, but one which even those with exceptional strength of will are unlikely to satisfy. And the worst of it is, that even a single indiscretion will often result in impregnation. Moreover, it is distinctly contrary to natural conditions, that a healthy married couple united by an intimate affection should live together abstaining completely from sexual intercourse. The question has already been much discussed, both in speech and writing, and this will continue in the future, without altering the fact that the physician will be asked, and will be

compelled to give, advice regarding the use of means of the prevention of pregnancy."

Ribbing writes, "Although the sexual impulse is the product of a powerful natural developmental force, still the temporary, and sometimes even the permanent, control of this impulse is a moral civilizing force of enormous importance." This writer is opposed to the use of artificial preventive measures; he considers them untrustworthy and dangerous to health. Untrustworthy, for the reason that nature has endowed living organisms with a strong impulse toward conjugation and has equipped with very powerful forces the processes by which fertilization is effected. Every physician is familiar with cases in which preventive measures have proved ineffective. This fact is proved also by the statistics of prostitution. Although prostitutes are fully instructed in the use of preventive measures, which they almost universally employ, nevertheless every year a smaller or larger number of prostitutes become pregnant. These measures are dangerous to health, partly because of their interference with natural functions, because many of them are clumsy and ill adapted; and partly, again, because owing to their use the woman fails to enjoy the natural periods of repose which are entailed by pregnancy, parturition, and lactation. Noteworthy also are the psychical considerations adduced by *Ribbing* against the use of preventive measures. The majority of well-bred women feel deeply wounded if they believe themselves to be regarded merely as a means of enjoyment, not as individuals, as persons with inalienable rights. For the man also there is danger, for it is easy for him to acquire a dislike to the wife who, even though on his own initiative, occupies herself with the technique of the sexual life in a manner which he feels instinctively to be opposed to the chastity and puremindedness demanded by every man from his wife. *Ribbing* therefore advises a certain measure of sexual abstinence in married life.

Max Nordau also insists on the moral disadvantages of the wide diffusion of the use of preventive measures. "If a race or nation has reached this point in its downward career, the individuals of which it is composed lose the capacity of loving in a healthy and natural manner. The sense of the family disappears; the men will not marry, because they find it inconvenient to burden themselves with the responsibility for another human life, and to care for any other creature than themselves; the women dread the pains and inconveniences of motherhood, and if they marry, they endeavour,

by the employment of the most immoral means, to ensure barrenness. The reproductive instinct, of which reproduction has ceased to be the aim, is in some annulled, whilst in others it degenerates into the most peculiar and irrational perversities. The act of sexual union, the most sublime function of the organism, is degraded into a profligate act of lust; it is no longer undertaken in the interest of the perpetuation of the species, but exclusively for the pleasure of the individual, and without any relation to the needs of the community."

Alfred Russel Wallace has advocated sexual continence as a preventive measure during the period of maximum vitality and strength; he advises that the age of marriage of women should be considerably advanced, in order to diminish their fertility. If woman's average age at marriage were 29, instead of 20 years, the fertility of marriages would be reduced in the ratio of 8:5.

The desired goal of artificial sterility will not, however, be reached through the advocacy of moderation and continence. The numerous additional measures employed for this purpose may be classified as *physiological* and *artificial*; the latter class may be further subdivided into *mechanical* and *operative*.

By physiological means for the prevention of conception, we understand measures which aim at producing sterility by reducing the number of acts of intercourse and by restricting these acts to certain defined periods of time. The physiological preventive measures, apart from the higher ethical value they possess in comparison with artificial measures, have the advantage that they may be regarded as harmless to the general health of the woman and to the integrity of her reproductive organs in particular; they have, however, this very serious disadvantage, that the results of their use are very uncertain, so that they offer no more than a probability, and often a very moderate probability that conception will be prevented.

As a physiological measure for the attainment of facultative sterility "without breaking any moral law," *Capellmann* advised abstinence from coitus during a period of fourteen days after menstruation and three to four days before the commencement of the flow. Without laying too much stress on the fact that by following this recommendation the period during which the intercourse is permissible would be extremely restricted, it is necessary to point out that, whilst in this way the occurrence of conception may be rendered less probable, its prevention is by no means guaranteed,

for it is an established fact that a woman may be impregnated by intercourse on any single day of the intermenstrual interval. *Capellmann's* advice, embodying, as he expresses it, the "only morally permissible" means for the prevention of conception, was not original, for the same recommendation was given at an earlier date by *Raciborski*, who, however, regarded the measure as very uncertain. *Capellmann* is of opinion that it is sufficiently trustworthy for practical purposes.

Bebel, who is a declared opponent of Malthusianism, none the less lays down positive rules for the diminution of procreative capacity and of fertility by regulation of the diet. He refers to the example of the bees, which, by a change of nutriment, can produce a new queen-bee at will. "Thus the bees," he says, "are in advance of human beings in their knowledge of sexual development. Presumably they have not been compelled, for a couple of thousand years, to listen to sermons informing them that to occupy themselves about sexual matters is 'improper' and 'immoral.' There is no doubt whatever that the mode of nutrition has an influence on the composition of the male semen, and also on the susceptibility to fertilization of the female ovum; hence the increase in population must to a very important extent depend on the mode of nutrition. If this could be definitely established, we should have, in the supply of nutriment, a means of regulating the population. As an example of the effect, in this connection, of the mode of nutrition in the human species, it is reported that in consequence of the fatty and nutritious diet of the old Bavarian peasants, who lived chiefly on very rich puddings, the marriages of the well-to-do peasants were frequently childless. However, it must not be forgotten that pre-conjugal intercourse, which was customary in that part of the world, and was somewhat promiscuous in character, may have contributed to cause this sterility." Finally, *Bebel* points out that the woman of the future "will be unwilling to bear a large number of children. She will wish to enjoy a measure of personal freedom and independence, and will not consent to pass half or three-quarters of the best years of her life either pregnant, or with a child at her breast. From this it will result that the population will be regulated, without unwholesome sexual abstinence, and without the employment of unpleasant preventive measures." However, *Bebel* gives us no details as to the precise manner in which this regulation is to be effected.

Tolstoi, in his widely celebrated book "The Kreuzer Sonata,"

condemns absolutely the gratification of the sexual impulse. He demands the recognition of the fact that "sexual congress, in which a man either avoids the natural consequences—the birth of children,—or else throws the whole burden of these consequences on the woman, is opposed to the simplest demands of morality, is in fact utterly base." To render possible the sexual abstinence he regards as morally necessary, men must not only endeavour to live in a natural way, but they must consume no alcohol, eat with great moderation, abstain from meat, and not be afraid of hard work. *Tolstoi* even demands that men and women shall be so brought up "that both before and after marriage they may regard love, and the sensual passion associated therewith, not as they do at present, as a sublime and poetical state, but as a bestial condition degrading to humanity." *Tolstoi* is, however, utterly opposed to the use of preventive measures: "first, because they liberate men from the cares and sorrows entailed by having children, which must be regarded as the penance to be paid for sensual love; and, secondly, because their use is closely allied to the crime most repugnant to the human conscience, the crime of murder." Chastity is no less a duty after marriage than before; after marriage man and wife must "continue to pray to be delivered from temptation, and must endeavour to replace sensual love by the pure relationship of brother and sister."

Eulenburg regards the modern diffusion and the continuous increase in the use of preventive measures as signs of decadence; *Löwenfeld*, on the other hand, regarding the social conditions of the present day as the principal source of the use of preventive measures, sees therein no moral decay, but on the contrary rather a rise in the moral standard of life.

Another physiological means of prevention is to be found in avoiding cohabitation in that season or month in which, judging by the woman's previous deliveries, she would appear to have been peculiarly susceptible to impregnation. *Cohnstein* maintained that in woman, as in the lower animals, the capacity for conception was associated with a particular season of the year, that there was, in fact, an individual time of predilection for impregnation. The assumption that there is such a time of predilection is, however, traversed by the fact, familiar to all who have recorded the birth-days of children in large families, that these occur in the most diverse months of the year. It has, indeed, been statistically proved that certain months and seasons are especially favourable to conception, that a maximum of conceptions occurs in the spring, and

a second much smaller maximum in the winter; but these variations in the number of conceptions depend mainly on social factors, as, for instance, upon the customary season for marriage, opportunity for intercourse between the sexes, common labours in the house or in the open, etc. This alleged time of predilection for conception cannot, therefore, seriously be considered in the discussion of measures for the prevention of pregnancy.

As a physiological means for preventing conception, passivity of the woman during sexual intercourse has also been recommended. It is well known that an active participation on the part of the woman in the sexual act, by increasing her voluptuous sensations, gives rise to certain reflex actions, viz., descent of the uterus, rounding of the os uteri, induration of the portio vaginalis, and, finally, ejaculation of the secretion of the cervical glands and of the glands of Bartholin; these changes accelerate the entrance of the semen into the cavity of the uterus, and increase the motility of the spermatozoa. Upon this fact is based the assumption, that, in consequence of deficient sexual excitement during intercourse, either spontaneous, or when the woman intentionally remains "cold," the reflex actions by which the upward passage of the spermatozoa is favoured, fail to occur; there is a good deal of evidence in favour of the truth of this view. *Riedel* reports regarding the women of the Island of Buru, that they often have sexual intercourse with strange men, "but during sexual congress in such cases they maintain a passive and indifferent state, for the purpose of avoiding impregnation." *Von Krafft-Ebing* points out that prostitutes, when having sexual intercourse with men to whom they are attached, experience voluptuous excitement, whilst in intercourse with men to whom they are indifferent they remain entirely passive. From this it would appear that these uterine reflexes are under the dominion of the conscious will; but sufficient dependence cannot be placed on this fact in all circumstances for it to be possible to employ such voluntary control as a trustworthy means of prevention. Allied to this is previously-mentioned Chinese practice of Kong-fou, a kind of hypnosis, in which during sexual intercourse the thoughts are concentrated on some other matter, and thereby conception is supposed to be prevented.

Artificial protraction of the period of lactation is an old and well-known method, practised by many savage peoples, for the prevention of fertilization. As a general rule, as long as lactation continues, amenorrhœa persists, and sexual intercourse remains unfruitful. But this rule also is not universally valid.

Artificial means for the attainment of facultative sterility are those by which the attempt is made to prevent pregnancy by some mechanical hindrance to the contact of the semen with the ovum, since without this contact conception cannot possibly occur.

The oldest of these means is that described in the book of Genesis (ch. xxxviii, verses 9, 10), *congressus interruptus*, where, however, the practice was punished by death, "And Onan knew that the seed should not be his; and it came to pass, when he went in unto his brother's wife, that he spilled it on the ground, lest that he should give seed to his brother. And the thing which he did displeased the Lord, wherefore he slew him." This mode of preventing pregnancy, in which the *membrum virile* is completely withdrawn from the vagina before the ejaculation of the semen takes place, is at the present time a very widely diffused practice; and, when properly carried out, it is thoroughly efficacious in the production of sterility. *Thompson* relates that this practice is employed by the Massai youths, who are allowed free intercourse with the girls, but if a girl becomes pregnant she is put to death.

The prolonged practice of *coitus interruptus* leads in my experience—in addition to the injury to the nervous system as a whole in consequence of the intense hyperæmia of the uterus and the uterine annexa, unrelieved by the occurrence of the orgasm—to a condition of stasis in the female reproductive organs; and this ultimately passes on into chronic metritis (with relaxation of the uterus, retroflexion or antelexion, catarrhal disease of the mucous membrane, erosions, and follicular ulceration of the *portio vaginalis*), oöphoritis and perimetritis. As a result of certain remarkable observations, I must even regard it as not improbable, although actual proof is still lacking, that the recent striking increase in the frequency of neoplasms of the female reproductive organs is causally dependent on the ever-increasing employment in all circles of society of means for the prevention of pregnancy.

The evil effects of *coitus interruptus* for a woman are dependent on the fact that the woman fails to obtain complete sexual gratification, and that this has an important influence upon her entire organism. Owing to the failure of ejaculation to occur, the blood, which during the stage of sexual excitement has accumulated in the erectile structures and cavernous spaces of the genital passage, does not, as in normal conditions, flow rapidly away; but the congestion persists for an indefinite period, and is said by *von Kraft-Ebing* to give rise to functional disorders, and also to serious tissue

changes. The functional disorders take the form of hyperæmia of the pelvic organs, and probably also of the lumbar portion of the spinal cord (dull pain in the sacral region, a sensation of pain and dragging in the pelvis and in the lower extremities, lassitude); these symptoms often continue for several hours after intercourse. If this ungratifying coitus is frequently repeated, in a voluptuous woman, disorders of the reproductive organs ensue; and even more frequently, nervous disorders, in the form of neurasthenia sexualis. This author considers that, more especially in women, coitus interruptus, and unphysiological modes of sexual intercourse in general, are extremely potent causes of sexual neurasthenia — as potent as masturbation.

Beard, in his work on sexual neurasthenia, maintains that the sudden interruption of coitus (and also the use of condoms and similar appliances) is not only far more deleterious than unduly frequent normal intercourse; but he points out that it is necessary also to take into account the fact that (inasmuch as, owing to the unnatural mode of sexual intercourse, the possibility of fertilization is almost completely prevented) sexual intercourse is apt, in such cases, to be indulged in far more frequently, and often to gross excess. More particularly in such circumstances are evil effects on the nervous system likely to ensue, since we have a combination of excessively prolonged and frequent sexual intercourse, and of interference with complete sexual gratification.

Mantegazza believes that organic diseases of the spinal cord may actually result from congressus interruptus.

Hirt considers that even when marital intercourse is carefully regulated in respect of frequency, congressus interruptus may lead to neurasthenic manifestations.

Von Hösslin believes it to be indisputable that preventive methods of sexual intercourse may cause nervous troubles, and more particularly neurasthenic disorders, manifesting themselves chiefly in the sphere of the reproductive organs.

Eulenburg also declares that coitus interruptus is already a frequent cause of sexual neurasthenia in women, and that its evil influence in this respect is becoming more and more frequently manifest. He publishes two typical cases, in which, from this cause, in the one case, functional neuropathy, and in the other, local disorder of the reproductive organs, ensued.

Freud describes an "anxiety-neurosis," which is due to incomplete gratification of the woman during sexual intercourse. Coitus

interruptus is almost invariably harmful to the man; to the woman it is harmful if the man thinks only of himself, and interrupts the coitus as soon as ejaculation is imminent, without concerning himself about the woman's state of sexual excitement. If, on the other hand, the man waits until the woman's sexual gratification is complete, the significance of such an interrupted coitus as far as the woman is concerned is that of normal intercourse.

Isolated authorities, as for instance *Stille* and *Thompson*, have contested the alleged evil consequences of preventive methods of sexual intercourse. "It is habitual excess," says *Fürbringer*, "which does the mischief, not the unnatural character of the isolated act." *Löwenfeld*, who considers the opposition of medical men to "Malthusianism" not wholly justified, and believes that the dangers to health "which occur in isolated cases" are not very serious, maintains none the less that the medical man must advise his patients not to practise coitus interruptus. The mode in which conception is prevented is not, he thinks, a matter of indifference to the woman. The use of occlusive pessaries and similar appliances does not in any way interfere with the normal development of sexual gratification and cannot, therefore, have any direct influence in the production of nervous disturbances. A forgotten occlusive pessary, however, has in many cases caused local disorder in the vagina. When the man is fully potent the use of condoms can do no harm to the woman, since the only effect of the condom (in a very excitable woman) is to render the development of the orgasm a little more difficult, but not to prevent it. Congressus interruptus itself is, according to *Löwenfeld*, harmful to the woman only when, owing to deficient potency in the male or to deficient excitability in the female, the interruption takes place before the occurrence of the orgasm.

Valenta declared that coitus interruptus was one of the chief causes of chronic metritis. *Elischer* saw perimetritis result from this practice; *Gräfe* enumerates, as consequences of frequently repeated coitus interruptus, chronic hyperæmia of the uterus and oöphoritis; *Goodell* observed elongation of the cervix uteri; *Mensinga*, infarction of the uterus, œdema of the portio vaginalis, ulceration of the cervix, hysterical paroxysms, convulsions, cephalalgias, cardialgias, etc. *Lier* reports a case in which, after three years' continued practice of coitus interruptus, the menopause set in, with atrophy of the uterus; *Ascher*, in a similar case, saw chronic metritis ensue. According to *Kleinwächter*, coitus interruptus is

harmful to the woman to an extent by no means trifling, whereas the man, in whom ejaculation occurs, suffers comparatively little. *Fehling* believes that when coitus interruptus is practised only a small proportion of women experience sexual excitement. *Neugebauer* states that among the very numerous cases of uterine carcinoma he has treated, the majority of the patients admitted having practised coitus interruptus. *Pigeolot* makes a similar statement.

It must, however, be admitted that a certain number of medical men absolutely deny the dangers of coitus interruptus, whilst others consider them altogether trifling. Just as the trend of modern opinion is to believe that in normal men and women the dangers of masturbation are far less serious than was formerly maintained, so also many are now found to maintain that coitus interruptus is harmful only to those with hereditary neuropathic predisposition. Still more unwilling are many to admit that other preventive methods do women any harm. Thus *Wille* maintains that the continued fear of pregnancy will in most instances do more injury to the feminine nervous system than all the preventive measures in the world. To the nervously weak woman a trustworthy preventive of pregnancy is therefore often necessary and most helpful.

An artificial method for the prevention of the ejaculation of semen was communicated to me by a celebrated anatomist. It is practised in Transylvania and in France. During intercourse the woman, just before the male ejaculation begins, presses forcibly with her finger on the base of the erect penis just in front of the prostate; the urethra is occluded by this digital compression, the semen regurgitates into the bladder and is subsequently evacuated with the urine.

This practice may be compared with the mechanical expulsion of the semen from the female genital passage immediately after coitus. *Tairi* reports that women of the poorer classes in Italy sit upright in bed immediately after intercourse, and by coughing, in conjunction with pressure on the abdomen, effect the expulsion of the semen. *Morton* informs us that the native women of Northern Australia, when they have had intercourse with a white man and wish to avoid impregnation, likewise deliberately effect the outflow of the semen *post actum*. The woman squats upright, with the legs widely separated, and by a sinuous movement of the perineum and a simultaneous powerful bearing-down pressure she expels the semen on to the ground.

Another way in which the attempt is made to avoid impregnation

is by the use of vaginal injections; a fluid lethal to the spermatozoa being used for this purpose immediately after coitus. Douches of cold water, $\frac{1}{2}$ to 1% solution of copper sulphate, 1% solution of alum, $\frac{1}{4}$ % solution of sulphate of quinine, are the fluids most commonly employed; but all these are quite untrustworthy, for it is impossible to be sure that all the spermatozoa will be acted on and destroyed. *Allbutt*, who as medical secretary of the Malthusian League in London has unquestionably had a very wide experience, agrees with *Haussmann* in denying that the widely advocated cold water douche can be relied on for the prevention of pregnancy. The sudden driving of the blood out of the vessels of the genital passage at the very moment when they are intensely congested, which must inevitably result from a cold douche, is, moreover, likely to give rise to metritis, perimetritis and oöphoritis.

More trustworthy are the various apparatus, the aim of which is to prevent the contact of the semen with the ova by the interposition of an artificial wall. Although even as regards these we must bear in mind the observation of *Lott*, who found that spermatozoa were capable of passing through the intact membrane in favourable regions in as short a time as ten minutes. The commonest of all these apparatus is the article known as a condom, which envelops the penis with a membrane, variously consisting of isinglass, the lamb's cæcum, or caoutchouc. Condoms, if made of suitable material, and if carefully used, are the most trustworthy of all preventives. Moreover, the injury caused by their use to the woman's health is trifling, for they do no more than diminish to a degree the intensity of the stimulus, thus necessitating a somewhat longer duration of its action in order to effect the most intense orgasm, and thus to induce the natural physiological termination of the nervous excitement. In fact, though somewhat delayed, the normal reaction takes place in the reproductive organs. The evil effect of the use of the condom bears no comparison with that of coitus interruptus. There is, however, some justification for *Ricord's* well-known epigram, that the condom is "a spider's web for the prevention of danger, and a cuirass for the prevention of voluptuous pleasure."

When the gynecologist, from well-considered reasons based on some pathological condition affecting his patient, feels justified in recommending the prevention of pregnancy, it is my opinion that the most trustworthy and least harmful measure at present available, and one preferable to all other mechanical apparatus, is a carefully selected and well-made condom.

The condom was already in use in Italy in the middle of the sixteenth century, in the form of a linen investment adapted to the shape of the penis; subsequently, according to *Grünfeld*, condoms were made from the cæcum of the lamb; while later still, isinglass was employed for this purpose. According to *Hans Ferdy*, the cæcal condom is made from the connective-tissue layer of the cæcum of the sheep or of the calf (a very young animal); to a less extent, also, the cæca of the goat, the stag, and the roe-deer, are employed for this purpose. The different varieties of cæcal condom are distinguished chiefly by variations in the thickness and the softness of the membrane. *Ferdy* states that the four best kinds are made from the cæcum of the sheep; these have a thickness: I. 0.008 to 0.01 mm. (0.00032 to 0.0004 in.); II. 0.012 to 0.015 mm. (0.00048 to 0.0006 in.); III. 0.017 to 0.023 mm. (0.00068 to 0.00092 in.); IV. 0.025 to 0.03 mm. (0.001 to 0.0012 in.) Next in quality come four varieties obtained from the calf, varying in thickness from 0.015 to 0.04 mm. (0.006 to 0.016 in.) Finally we have three varieties obtained from the three other animals already mentioned. Thus there are in all eleven varieties of cæcal condom, and in so far as during the process of manufacture the membrane has remained free from any injury, they are sold as "undamaged." But if in the process of preparation a hole has been made in the membrane, this aperture is closed by sticking on a small patch of membrane. Such patched condoms are naturally quite useless, since the patch is readily loosened by the moisture to which it is exposed, and falls off, when the protective and preventive functions are entirely destroyed; nevertheless, such defective condoms are often sold. Rubber condoms, continues *Ferdy*, are prepared from a caoutchouc membrane 0.03 to 0.1 mm. (0.0012 to 0.04 in.) in thickness; but these, he says, are not hygienic, for "such a rubber membrane, which both in the man and in the woman completely covers the erogenic zones normally stimulated in coitus, deadens the necessary stimulation, so that the sensations during coitus are seriously dulled by the interposition of this foreign body; by nervously predisposed individuals, this kind of condom cannot be used regularly for a long period, without rendering probable the onset of serious functional disturbances of the genital apparatus." This opinion appears to me to be unfounded. We must also mention the "glans-condom," made of rubber membrane, which serves to cover the glans penis only during coitus, and to retain the seminal secretion; its grave defect, however, consists in

this, that in the act of withdrawing the penis, the condom is very likely to be peeled off, when the semen will, after all, pass into the vagina.

Passing now to the consideration of apparatus which are inserted into the woman's genital canal, in order to prevent impregnation, we may first mention sponges, which have long been in use; after thorough cleaning, these may be rendered aseptic by immersion in carbolic acid or lysol solution. These sponges should be very soft; they are cut into balls of 3 to 7 cm. (1.2 to 2.8 in.) in diameter; before coitus they are introduced into the vagina and after coitus they are withdrawn by means of the tape which should always be attached to them. This method is, however, quite untrustworthy, for the sponge offers no impermeable wall to the passage of the spermatozoa, and on its withdrawal, some of the semen may very likely be left in the vagina. The same objection must be made to the similarly constructed anti-conceptional cotton-wool plugs; sometimes these are moistened with a fluid intended to destroy the spermatozoa. Recently *Gunzburg* has recommended the introduction into the vagina of a cotton-wool plug moistened with a three per cent. solution of carbolic acid in glycerine; he considers this method safe, because the spermatozoa are immediately destroyed on contact with the weakest carbolic acid solutions.

To destroy the vitality of the spermatozoa, vaginal suppositories made of cocoa-butter medicated with hydrochlorate of quinine have also been employed; these, the so-called "security-pessaries" or "security-ovals," are inserted into the vagina half an hour before coitus; the cocoa-butter is melted by the body heat, and the vaginal mucous membrane and the os uteri are covered with the medicated fatty material, by which the spermatozoa are (or should be) destroyed. This method is one easy to employ, but it is extremely uncertain.

Even more uncertain are the insufflators charged with various powders (boric acid, citric acid, thymol, etc.); the tube of the insufflator having been passed into the vagina, the powder is blown over the vaginal mucous membrane and the portio vaginalis. This procedure may sometimes be followed by symptoms of intoxication; and in any case, owing to the dessicative effect which the powder has upon the vaginal mucous membrane, it exercises a disturbing influence on coitus.

Kleinwächter, in cases in which pregnancy must be prevented in the interest of a woman's health or her life, has recommended the

introduction into the vagina of globules of which the active constituent is boric acid.

A rationally constructed apparatus, and one which in general appears to fulfil its purpose very well, is the *pessarium occlusivum* constructed by *Mensinga*, and now manufactured in various modifications. The occlusive pessary is a hollowed hemisphere of rubber membrane, around the margin of which passes a steel ring. The size of the pessary must be adapted to the individual case. It is introduced into the vagina in such a way that the outer surface of the hemisphere occupies the vaginal fornix, while the steel ring touches the vaginal wall all round; by this means, the vaginal fornices and the os uteri are completely shut off from the lower part of the vagina. The disadvantage of this instrument is, that either the woman must wear it continuously, which involves numerous inconveniences, or else it must be introduced by the skilled hand immediately before coitus—and not every woman becomes competent to adjust it herself, even after careful explanation, since the pessary must be accurately placed with the anterior margin of the ring immediately behind the pubic symphysis, and the posterior margin of the ring behind the os uteri. Moreover, the instrument may easily be displaced by violent movements, coughing, sneezing, etc. In any case, the pessary must be carefully selected to correspond within the configuration of the vagina, as otherwise it may exercise a deleterious pressure upon the vaginal walls, and may give rise to other bad consequences, such as are apt to attend the wearing of any pessary for a prolonged period—excoriations, erosions, fluor albus, etc. In the majority of cases it will be found that the woman herself is not competent to introduce the occlusive pessary. The skilled hand is needed for the proper adjustment of the surrounding ring.

Gall's balloon-occlusive-pessary consists of a soft elastic rubber disc, surrounded by a thin-walled rubber ring, the interior of which is connected by means of a fine tube with an inflating rubber ball. The woman can herself insert the instrument and inflate the ring; it occludes the vaginal passage without exercising any deleterious pressure.

Other pessaries consist of hollow rubber balls containing some fluid lethal to the spermatozoa, which can be discharged into the vagina on opening a valve by pulling a string. These, however, are as insecure as the above-mentioned vaginal discs and the insufflators. The duplex-occlusive-pessary has the form of a truncated cone

with double walls; in its base are a number of rounded apertures, and a single elongated aperture; through this latter a boric acid tablet is introduced into the cavity of the cone. By means of the cone the passage to the uterus is mechanically occluded; the semen passes through the apertures in the base into the interior of the instrument, and as the boric acid tablet is dissolved by the moisture to which it is now exposed, the vitality of the spermatozoa is destroyed. The management of this apparatus is, however, not easily effected by the woman herself. The "Matrisalus-Pessary" differs but little from other occlusive pessaries. The latest instrument for the prevention of impregnation is known as the "Venus-Apparatus;" it consists of a syringe with two balls, a large and a small one, at either end of a rubber tube; by pressure on the larger ball, and subsequent relaxation of pressure, the smaller ball is filled with a fluid for the destruction of the spermatozoa (prepared by the solution of one of the "Venus-powders" sold with the instrument); when filled, this smaller ball is introduced into the vagina and remains connected by means of the tube with the larger ball, which lies between the woman's thighs. At the moment of the male ejaculation the woman presses on this ball, and by this means the fluid filling the smaller ball is expressed into her vagina.

All these mechanical occlusive pessaries are open to the objection that they are apt to give rise to irritative conditions of the genital organs, causing offensive discharges, pruritus, etc. (Recently in order to diminish this drawback, the pessary has been constructed of vulcanized cambric, instead of rubber, and appears then to have a less irritating effect.) Still worse is the injury to the uterus and to the cervical mucous membrane caused by certain intra-uterine instruments which have been recommended for the prevention of conception. The latest of these is an "obturator," consisting of a silver or silver-gilt tube, which is passed through the os uteri into the interior of the uterus, and left *in situ*. It is claimed for it that "it allows the menstrual discharge to flow freely away, but renders the entrance of the spermatozoa extremely difficult." *Biermer* reports five cases in which serious injury to health followed the use of one of these obturators. In one of these cases in which there were very severe pains and a discharge from the uterus, *Biermer* removed from the interior of the uterus a broken wing of the obturator; the patient died, however, and the autopsy disclosed perforation of the uterus. In another of the cases the apparatus was also broken.

Less dangerous is the recently invented tampon-speculum. This is passed into the vagina by the woman herself, in order that through it she may, by means of a special introducer, insert a tablet of boric acid, hydrochlorate of quinine, citric acid, or some other substance lethal to the spermatozoa. Without some such instrument, the introduction of these "ovals" to the proper place is often found difficult by women.

A very remarkable means of bringing about artificial sterility, one resembling the operative procedures sometimes adopted in western countries, is employed in various parts of the world, and notably in the East Indies and in the Sunda Islands, namely, the induction of an artificial malposition of the uterus, more especially of anteversion. Thus, *van der Burg* writes from the Dutch Indies: "In the girls the sexual impulse develops very early, and is gratified without fear of consequences, when the services of certain skilled elderly women have been requisitioned. These women appear, in fact, to understand, by means of pressure, rubbing, and kneading, through the abdominal walls (not by the vaginal route), how to induce anteversion or retroversion of the uterus, to such an extent as to prevent the occurrence of conception. It is said that the only inconvenient consequences of this procedure are trifling pains in the lumbo-sacral and inguinal regions, and some trouble in passing water during the first few days after the manipulations have been effected. Later, when a girl who has been treated in this way wishes to marry and become a mother, by a reversal of the manipulations the uterus is restored to its natural position. It is said that these skilled women have been called in by European women in the Dutch Indies, who did not wish to have many children; but it appears that in a woman who has once given birth to a child, the result of the manipulations is less to be depended upon, than in the case of a virgin.

A means of ensuring artificial sterility, which in all civilized states is punishable as a criminal offence, and which is nevertheless very frequently practised, is the artificial induction of abortion. Especially in North America it would appear that there exist regular professional abortionists. In this connection, *Thomas*, the well-known American gynecologist, writes as follows: "Statistics showing the frequency of criminal abortion are not, and probably never will be, available, for this crime cannot be adequately controlled by human society, and commonly eludes legal punishment. It seems a hard saying, but it is a true one, to assert, that the law pursues

unremittingly him who has killed his fellow-man, while it leaves immune him who has killed the embryo in the mother's womb. On my table there lies at this moment one of the most widely circulated, most respected, and most carefully edited daily newspapers of New York—a paper which finds its way into the best circles of society, and also into the hands of girls and women throughout the country. In its columns I find fifteen advertisements which emanate beyond all question from professional abortionists—from men and women who gain their livelihood by child-murder.”

O. Reyher remarks also that in American newspapers advertisements such as the following are of every-day occurrence: “Pills for the regulation of the periods. Ladies expecting to be confined are warned not to use them on any account, for if they do so abortion will infallibly ensue.”

Emmet, in his “Textbook of Gynecology” also complains of the terrible frequency of criminal abortion, so that “every day we see more unhappiness and misery result from the misuse of conjugal relationships than we see in an entire month as a result of births which take place in a natural manner.”

Pomerey also says that “The prevention of conception and the destruction of the unborn life are pre-eminently American sins;” and he adds that if no bounds are set to their spread, “they must, sooner or later, lead to universal misfortune. In the course of our practices we come into contact with women who would hesitate to kill a fly, but who think nothing of having destroyed half a dozen or more of their own unborn children.”

The American Medical Congress offered a prize for a brief and readable essay, suitable for diffusion among women, showing the criminality and the physical harmfulness of artificial abortion. The prize was awarded to *Storer's* essay, entitled “Why Not?”

Among the ancient Greeks, the fear of over-population led to the practice of homosexual intercourse. The states of ancient Greece were in most cases of a very small area, so that a very moderate increase in population would render the means of subsistence insufficient. Hence intercourse with women was avoided, and the sexual impulse was gratified in unnatural ways. Inspired by this fear of over-population, Aristotle urged upon men that they avoid women, and should indulge in the love of men and boys, and at an earlier date, Socrates had celebrated the love of boys as a mark of higher culture. The most notable men of classical Greece practised homosexual intercourse; authors and poets celebrated the love of boys. Stimulated by their example, Sappho of Lesbos be-

came the inspired poetess of the love of women for members of their own sex (Lesbian love).

Among the Romans it was rather satiety in consequence of sexual excesses which led in that country to the diffusion of the Greek love of boys; the consequent childlessness diminished to such an extent the numbers of the Roman burghers and patricians, that Augustus, in the year 16 B. C., enacted the Julian law, by which the procreation of children was rewarded, whilst celibacy became a punishable offence.

At the present day the fear of an excessively large number of children, in relation to the property possessed by the parents and in regard to nutritive possibilities, has led among whole classes, and even among entire nations, to the adoption of preventive measures in sexual intercourse; these measures have, in fact, been developed into a system, which finds adherents among all strata of the population, but more especially, as it is easy to understand, among certain well-to-do sections of the community. In France this system has been adopted to such an extent as to amount to a national calamity.

In few countries of the civilized world, remarks *Bebel*, are marriages so frequent, relatively to the population, as they are in France, whilst in no country is the average number of children per marriage so small, or the increase of population so slow. The French bourgeoisie long ago adopted this system, and the peasantry and the artizan classes are following their example. In many parts of Germany the same causes have led to the same results. In France, in addition to the prevention of pregnancy and the practice of artificial abortion, infanticide and the exposure of children are also actually employed to keep down the population.

Operative measures for the production of artificial sterility have been practised from very ancient times, and by civilized and savage peoples alike. According to *Strabo*, the ancient Egyptians and Lydians were acquainted with the art of removing the ovaries from girls and women. The kings of Lydia, Andromytes and Gyges, had the women of their harems castrated, *ut iis semper ætate et forma florentibus uteretur*. *Von Micklucho-Mackay* reports that in some parts of Australia the indigens remove the ovaries of certain girls, in order to provide their young men with hetairæ who cannot possibly become pregnant. *M. Gillirray* saw at Cape York a native deaf and dumb woman whose ovaries had been removed, to prevent her procreating deaf and dumb infants.

We cannot refrain from reference to the astounding proposal of *C. A. Weinhold*, contained in his work upon the over-population of Central Europe and its consequences to the countries concerned and to civilization in general. He advises, "as a general and urgently required measure, the widespread practice of a sort of infibulation, which is to be undertaken at the age of fourteen and preserved until marriage, and is to be performed in the case of all those individuals who can be proved not to possess sufficient property for the upbringing of an infant, if they should become pregnant as a result of extra-conjugal intercourse. And in those who never attained a financial position in which they might be able to bring up a family, the infibulated condition should be allowed to persist throughout life!"

This proposal is, in fact, no novelty, inasmuch as the bringing about of an artificial adhesion of the labia with a view to the prevention of conception—the operation of *infibulation*—is practised by many savage peoples. According to the detailed account given by *Ploss-Bartels*, this operation, in which the inner surfaces of the labia majora are freshened, stitched together, and allowed to adhere, is practised by the Bedschas, the Gallas, the Somalis, the inhabitants of Harrar, at Massaua, etc. The purpose of this practice is to preserve the chastity of the girls until marriage, when the reverse operative procedure is undertaken. If the husband goes away on a journey, in many cases the operation of infibulation is once more performed upon his wives. Slave-dealers also make use of this operation so as to prevent their slaves from becoming pregnant. It is reported, however, that the operation does not invariably produce the desired effect. *Hartmann* informs us that in Nubia, in Senaar, and in part of Kordofan, the præputium clitoridis or the entire clitoris is cut away, and the margins of the nymphæ are then freshened and stitched together, so that the only aperture left is one sufficiently large for the outflow of the urine.

Brehm states that the operation is performed by old women, who make the necessary incisions with razors; shortly before marriage, the bridegroom sends the girl's relatives a model of his penis, carved in wood, according to the size of which an aperture is made between the adherent nymphæ; when the woman becomes pregnant, the incision is still further enlarged. In the kingdom of Darfur, the labia majora as well as the nymphæ are freshened and stitched together. In the Berber country, *Werne* became acquainted with a young widow whose husband had had her submitted to the opera-

tion of infibulation no less than seven times. Another somewhat less brutal method of performing infibulation is described by *Ploss*, as being practised by many Eastern races; a ring is fastened through the labia in such a way as to guard the introitus vaginæ. In Europe, during the Middle Ages, such and similar apparatus ("girdles of chastity") are said to have been employed for the protection of the honour of an absent husband.

Of gynecologists who have advised operative measures for the prevention of pregnancy, in women in whom that condition involved serious dangers, the first, as far as I know, was *Blundell*. As a result of experiments made on rabbits, he suggested division of the Fallopian tubes as the best way of attaining this end. Later, *Froriep* and *Kocks* also endeavoured to induce artificial sterility in women by occlusion of the Fallopian tubes. *Froriep's* idea was to bring about obliteration of the lumen of the tubes by means of cauterization with nitrate of silver; *Kocks* constructed for the same purpose a galvano-caustic uterine sound. But, in the first place, both the methods advocated are too uncertain to be relied upon; and, in the second place, their application is neither easy, nor devoid of serious risk.

Much more effective, however, is the method recommended by *Kehrer* for the sterilization of women, namely, division of the Fallopian tubes by the vaginal route. *Kehrer* considers that the physician is justified in preventing the occurrence of pregnancy in a number of morbid conditions—incurable nervous, cardiac, pulmonary, gastric, and renal disorders; various constitutional affections; and, finally, in cases of pelvic deformity of such a degree that the delivery of a living child is impossible except by means of Cæsarean section, but the patient does not wish to be exposed to the risks of this operation. He believes, moreover, that all the methods commonly recommended for the prevention of pregnancy are untrustworthy. So powerful, however, is the sexual impulse, that, as experience shows, the mere prohibition of sexual intercourse, however earnestly made, invariably proves ineffectual. For coitus interruptus to be effective, the interruption must occur at the right moment; and this does not always take place. Cold water douches after coitus are unhygienic; douches of warm water, medicated with sublimate, alcohol, and other drugs lethal to the spermatozoa, are indeed rationally conceived, but often fail of their effect, either because they are deferred until too late, or else because they fail to irrigate all parts of the vagina. Plugs of cotton wool,

sponges, etc., are not always introduced in such a way as effectually to occlude the vaginal passage. A suitable and properly introduced occlusive pessary is, indeed, a relatively trustworthy preventive apparatus, but if worn continuously it is apt to become very foul. A thorough douching of the genital passage with an antiseptic solution, performed by the skilled hand, immediately after coitus, would doubtless destroy the spermatozoa with the like certainty with which the same procedure destroys micro-organisms when performed prior to a gynecological operation — but when carried out by the layman, the value of the method is more than doubtful. The operation, for a time actually fashionable, of extirpation of the uterine annexa, certainly gives rise to sterility, but entails the serious disadvantage that the consequent premature menopause is attended by the same disturbances as the natural change of life. On the other hand, section and ligature of the Fallopian tubes is considered by *Kehrer* to induce sterility without in any other way disturbing the functions of the female reproductive organs. By means of anterior colpotomy we obtain a suitable route for the ligature and section of both tubes at the isthmi. When carried out with the proper antiseptic precautions the operation is almost entirely free from risk; and when the organs are healthy the closure of both the upper and the lower segments of the tubes is effected, and no retention of secretions need be feared as a result of the operation.

With regard to the indications for the performance of this operation, *Kehrer* insists that it should be undertaken only in cases of serious disease, and when the pros and cons have been conscientiously weighed. A consultation is also indispensable. Moreover, it is essential that husband and wife should both fully understand the nature of the proposed operation, and should form an unbiassed judgment regarding its advisability. To avoid any possibility of subsequent reproaches, *Kehrer* advises that a written report should be drawn up, giving the reasons for undertaking the sterilization, and that this should be subscribed by the physicians in consultation, by the patient herself, and by her husband.

Arendt considers that in cases in which there already exists serious constitutional disease, the performance of this operation may lead to fever, severe hæmorrhage, injury to adjacent organs, and even death. He holds, therefore, that in such cases the physician should advise the use of some of the more ordinary methods of preventing conception (if simple abstinence from intercourse cannot be practised). Only in women with pelvic contraction of the

second or third degree, in whom previous children have been still-born, or subjected to craniotomy, is operative sterilization by *Kehrer's* method justifiable. But in preference to anterior colpotomy, as recommended by *Kehrer*, he prefers the longitudinal incision in the posterior vaginal fornix advised by *Boileux*. If the uterus is drawn down firmly, and the portio vaginalis then pushed forward against the pubic symphysis, it is easy, at any rate with the assistance of a little abdominal pressure, to draw part of the Fallopian tubes into the vaginal incision.

Recently *Pincus* has recommended the cauterization of the uterine cavity with superheated steam (*atmocausis, castratio uterina*). He advises it only in women who are incurably ill (tuberculosis, morbus Brightii, hæmophilia), so that pregnancy and parturition would involve almost certain death.

Kossmann considers that when pregnancy and parturition will endanger a woman's health and life, it is the physician's duty to acquaint both husband and wife with this fact; but having done so his duty is fully discharged. "If, after being warned, the married pair choose to indulge in sexual intercourse, they have knowingly and voluntarily run into danger, and for this the physician is in no way responsible."

As indications for facultative sterility *Levy* enumerates tubercular disease of the lungs, mental disorders, severe organic or functional diseases of the central nervous system, active syphilis (in certain circumstances), pernicious anæmia, hæmophilia, diabetes mellitus, severe heart disease, chronic disease of the kidneys or liver, certain pelvic deformities, and the tendency to habitual abortion.

I have myself before now stated my opinion that it is the duty of the physician, in the case of a married woman suffering from heart disease, with due regard to the danger which pregnancy will entail upon her, to give needful advice in the matter of the prevention of conception. In women affected with valvular heart disease, and in whom there are serious disturbances of compensation, conception is absolutely to be avoided; also in conditions of marked cardiac degeneration, and when there are distinct symptoms of insufficiency of the heart muscle. When, on slight exertion, palpitation, increased frequency of the pulse, and respiratory need ("air-hunger"), ensue; when there is extensive œdema of the lower extremities which persists even after confinement to bed; when the pulse readily becomes arhythmical both in respect of the strength and the temporal succession of the beats; when the urine

is scanty and contains varying quantities of albumen; when there are frequent attacks of heart-weakness, with a small irregular pulse, coldness of the extremities, a cyanotic tint of complexion, nausea, dyspnœa, sense of faintness, or actual syncope—in all such cases, whether dependent upon valvular disease, on pathological changes in the arteries, or upon disease of the myocardium, the occurrence of pregnancy is a true disaster, giving rise in most cases to a grave aggravation of the heart trouble and often enough costing the patient her life. I further regard it as a sound medical axiom that in cases of cardiac disorder of a less severe type than that just described the woman thus affected should not have more than one or two children. This is the more necessary because with each successive pregnancy the functional capacity of the diseased heart decreases in geometrical progression and the danger to life proportionately increases. But in such cases of heart disease the prevention of pregnancy must never be effected by the interruption of coitus by the man before ejaculation, for the reason that this procedure gives rise to manifold reflex cardiac troubles, and especially to paroxysms of tachycardia, with simultaneous diminution in vascular tone, vasomotor disturbances, and states of mental depression—and these entail exceptional dangers in women suffering from heart disease.

THE DETERMINATION OF SEX.

The problem of the determination of sex in the human species is one which has occupied natural philosophers from the very earliest times, and has always greatly interested all classes of the population.

The interest awakened by the subject depends principally on the fact that female children have usually been less desired than male in all periods of history and among almost all races. In the uppermost circles of society the truth of this statement is manifested by the fact that the birth of a prince is announced by a salute of 101 guns, that of a princess by a salute of 35 guns only.

It would serve no useful purpose to transcribe here the opinions, or rather guesses, which were ventured on this topic in earlier days when the very nature of the reproductive process was still entirely unknown, and we shall merely mention that the curious will find various references to the determination of sex in the works of *Hippocrates*, *Aristotle*, *Plutarch*, *Soranus*, *Susruta* and *Galen*.

Broadly speaking, the earlier theories may be said to diverge in two main directions, some holding that the sex of the infant was in some way determined by the mode of intermixture of the male and the female elements in the act of generation, and others maintaining that sex was already inalterably predetermined at the time of intercourse either in the male or in the female sexual elements.

Pari passu with the modern development of the theory of evolution, and with the enormous increase in recent days in anatomical and physiological knowledge, the theory of the determination of sex has been very widely extended. The rival views may be briefly arranged in the four following categories:

I. That sex is already inalterably predetermined in the ovum, upon the constitution of which it solely depends; there are therefore male and female ova, and the process of fertilization exercises no influence whatever upon the determination of sex. The alternative theory to the above, that sex is determined solely by the constitution of the fertilizing spermatozoon—*i. e.*, that the spermatozoa, and not the ova, are male and female, respectively—is one which in recent years has tended more and more to disappear from the field.

II. That sex is determined in the moment of fertilization by the reciprocal interaction of male and female, of zoö sperm and ovum. One variant of this theory maintains that each reproductive element strives for the reproduction of its own sex; that a struggle takes place and that the victor in the contest stamps its own sex-likeness upon the fertilized product. According to another view, however, sex is not directly transmitted in this manner; it is supposed that the more powerful the proper reproductive element (according to this theory the ovum) the more strongly does it tend to determine the reproduction of a stronger, *i. e.*, a male organism; thus the greater potency of the female element in the act of reproduction tends to favour the determination of the male sex.

III. That sex is not determined until after fertilization, during the early stages of the development of the embryo; the determining causes are supposed to be various factors capable of influencing the developing organism during this period, and more particularly the nutritive conditions of the mother.

IV. That the determination of sex is not dependent solely upon the action of any single one of the factors above enumerated, but arises as a resultant effect of the operation on the germ of all three of these acting in temporal succession.

Modern physiology has endeavoured to solve this problem by statistical investigations, by anatomical demonstration, and finally by experiment.

I. Statistical Investigations.

Statistical data have been collected showing the ratios between male and female births in the most varied conditions possible, and from these data the attempt has been made to draw valid conclusions regarding the causes of the determination of sex. Now in the first place it is above all necessary to bear in mind that such statistical data cannot possibly have any value unless they relate to very numerous instances, and even then they are liable to be invalidated by various sources of fallacy. We may with advantage quote in this connection the remarks of *Hensen* in his work on the "Physiology of Reproduction:" "Each individual instance is rendered unique in kind by the interaction of certain incommensurable elements; for instance the state of health of the individual organs in their innumerable combinations, variations in the general health of the parents, the frequency of coitus and the time at which it took place, the desire of the parents to have a son and then no more children, their social position—in these ways innumerable complications are introduced into the problem, and the difficulty of drawing valid conclusions is rendered almost insuperable, unless the number of instances dealt with is enormously large."

One fact definitely established is that more boys are born than girls, the proportion between the two, known as the sexual ratio, being 106:100. Statistics relating to the half of Europe (*Oesterlen*) and dealing with 59,350,000 births, showed a ratio of 106.3 male to 100 female births; in individual countries variations from this mean are found to occur, but these are not very extensive, the highest ratio being 107.2:100, and the lowest ratio 105.2:100.

From the works of *Hofacker* ("Ueber die Eigenschaften welche sich bei Menschen und Tieren von den Eltern auf die Nachkommen vererben"—Concerning the Qualities transmitted from Parents to Offspring in Men and Animals—Tuebingen, 1828) and *Sadler* ("Law of Population," London, 1830) conclusions have been drawn regarding the effect of a variation in the age ratio of the parents on the determination of sex. The deductions in question, known as *Hofacker* and *Sadler's* law, are as follows:

1. If the husband is older than the wife more boys are born than girls.

2. If husband and wife are the same age somewhat fewer boys are born than girls.

3. If the wife is older than the husband the excess of female births is larger still.

Hofacker's actual figures were the following:

Father younger than mother.....	90.1	boys to 100 girls.
Father same age as mother.....	93.3	boys to 100 girls.
Father 4 to 6 years older than mother.....	108.8	boys to 100 girls.
Father 6 to 9 years older than mother.....	124.7	boys to 100 girls.
Father 9 to 12 years older than mother....	143.7	boys to 100 girls.

Sadler's results were closely similar:

Father younger than mother.....	86	boys to 100 girls.
Father same age as mother.....	94	boys to 100 girls.
Father 1 to 6 years older than mother.....	103	boys to 100 girls.
Father 6 to 11 years older than mother....	126	boys to 100 girls.
Father 11 to 16 years older than mother...	147	boys to 100 girls.
Father 16 years and more older than mother.	163	boys to 100 girls.

Goehlert found that the offspring of marriages in which the husband was younger than the wife were 71 boys and 86 girls; of marriages in which husband and wife were of the same age, 263 boys and 282 girls; and of marriages in which the husband was older than the wife, 2,017 boys and 1,865 girls.

Wappacus, combining the data supplied by these three investigators, *Hofacker*, *Sadler* and *Goehlert*, obtained the following sexual ratios for the entire 8,000 cases (*i. e.*, the number of boys born to each 100 girls born): When the husband was younger than the wife, 88.2; when husband and wife were of the same age, 93.5; when the husband was older than the wife, 113.0.

It will be observed that the mean sexual ratio of these 8,000 cases is 109.6; whilst, as we saw above, when a sufficiently large number of instances is taken, the sexual ratio always closely approximates to 106.3. From this it appears that the numbers dealt with by *Hofacker*, *Sadler* and *Goehlert* in their investigations were too small for the deduction of trustworthy averages.

The same criticism is applicable to the observations of *Ahlfeld*, *Breslau* and *Noirot*, whose results conflict with those just given. According to *Ahlfeld*, in the case of 1,376 births where the father was at least 10 years older than the mother, the sexual ratio was only 98.2. According to *Noirot's* data, in cases in which the father was older than the mother, this ratio was 99.7.

Oesterlen gives the following brief summary of the researches made for the establishment and confirmation of the law of *Hofacker* and *Sadler*:

AUTHOR.	Father older than mother.	Father and mother same age.	Mother older than father.	Sexual ratio.	Number of in- stances.
Hofacker.....	117.8	92.0	90.6	107.5	1,996
Sadler.....	121.4	94.8	86.5	114.7	2,008
Goehlert.....	108.2	93.3	82.6	105.3	4,584
Noirot.....	99.7	.....	116.0	103.5	4,000
Legoyt (Calais).....	109.9	107.9	101.6	107.9	6,006
Legoyt (Paris).....	104.4	102.1	97.5	102.9	52,311
Breslau.....	103.9	103.1	117.6	106.6	8,084

The law of *Hofacker* and *Sadler* cannot be regarded as possessing universal validity, although the figures on which it is based seem to show pretty clearly that we are justified in regarding the mutual interaction of the male and female reproductive elements at the moment of fertilization as effective in the determination of sex. In the investigations to which we have hitherto alluded it is only the relative ages of husband and wife that have been taken into account; but other researches have shown that the absolute age alike of the husband and of the wife has an influence in the determination of sex.

The influence of the absolute age of the mother in the determination of sex has been very clearly established. *Ahlfeld* was the first to draw attention to the fact that among the children of elderly primiparæ there was always to be found an excess of boys, and that there was an increase in this excess proportionate to the greater age of the mother. Among 102 children born to primiparæ over 32 years of age the sexual ratio was 137:100; and a later investigation made by the same author in conjunction with *Schramm* showed that among 1,038 children born to primiparæ over 28 years of age the sexual ratio was 124:100.

Hecker obtained similar results. Among 432 children born to primiparæ over thirty years of age the sexual ratio was 133:100. *Winckel*, dealing with primiparæ of the same ages, found a sexual ratio of 136.8:100.

Düsing, examining the records of the lying-in hospitals of Leip-

zig, Dresden and Jena and thus obtaining a very large number of instances whereon to base his conclusions, confirmed the view that elderly primiparæ give birth to an excess of boys, and further that the older they are the larger the excess of male births. He drew up the following table:

Age of primiparæ.	Leipzig. Boys. Girls.	Dresden. Boys. Girls.	Jena. Boys. Girls.	Total Nos. Boys. Girls.	Sexual ratio.
15.....	1:—	1: 2	1:—	3: 2	549:494 =111.1
16.....	4: 4	6: 10	2: 2	12: 16	
17.....	23: 13	20: 15	9: 7	52: 35	
18.....	67: 55	103:100	17:13	187:168	807:781 =103.3
19.....	110:103	152:141	33:29	295:273	
20.....	148:147	187:185	32:45	367:377	
21.....	157:145	241:201	42:57	440:404	903:962 =93.9
22.....	120:133	191:207	48:53	359:393	
23.....	106:108	168:149	51:51	325:308	
24.....	71:105	111:118	37:38	219:261	531:469 =113.2
25.....	79: 57	73: 72	35:27	187:156	
26.....	45: 35	30: 43	20:20	125: 98	
27.....	31: 35	52: 55	10:12	93:102	155:104 =150.0
28.....	32: 33	26: 33	19:16	77: 72	
29.....	19: 10	26: 18	4:13	49: 41	
30.....	9: 15	30: 13	9: 6	48: 34	155:104 =150.0
31.....	3: 8	15: 11	3: 3	21: 22	
32.....	5: 6	12: 9	7: 3	24: 18	
33.....	2: 2	5: 5	5: 2	12: 9	155:104 =150.0
34.....	4:—	8: 5	2:—	14: 5	
35.....	2:—	9: 3	2: 1	13: 4	
36.....	1:—	3: 3	1: 1	5: 4	155:104 =150.0
37.....	4: 1	4: 3	1:—	9: 4	
38.....	—:—	—: 1	1:—	1: 1	
39.....	—:—	4:—	1:—	5:—	155:104 =150.0
40.....	1: 1	2: 1	1:—	4: 2	
41.....	—:—	—: 1	—:—	—: 1	

As an explanation of this statistically proved fact, that elderly primiparæ gave birth to a large excess of boys, *Düsing* suggests that these women who conceive for the first time comparatively late in life, are, prior to the conception, in a state corresponding with that of a lower animal species suffering from a deficiency of males, and for this reason exhibit a tendency to procreate a larger number of individuals of the deficient sex. In multiparæ also it is possible to trace the influence of a deficiency of male individuals. When there is such a deficiency the interval between successive births is unduly protracted. *Düsing* found (once more from the records of the lying-in hospitals of Dresden, Leipzig and Jena) that the longer

the interval between one parturition and the next the longer, that is to say, the mother has had to wait for her next conception, the greater is the excess of male births. *Düsing* therefore lays down the law: "Delayed impregnation gives rise to an excess of male births."

Interval in years.	Leipzig.		Dresden.		Jena.		Total Nos.		Sexual ratio.
	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	Boys.	Girls.	
1.....	162	158	194	178	58	45	414	381	108.6
2.....	366	307	374	361	168	145	908	813	111.6
3.....	198	196	207	194	116	94	521	484	107.7
4.....	127	109	132	106	59	45	318	260	115.7
5.....	59	54	55	54	38	38	152	146	
6.....	61	62	52	49	49	24	162	135	121.9
8, 9 and 10....	18	16	41	23	16	24	75	63	
11 and more....	25	15	12	9	4	6	41	30	

Totals: 4,903 births, 2,591 m.; 2,312 f.; sexual ratio = 112.06.

Bidder considers that his own observations entitle him to modify *Ahlfeld's* dictum regarding the influence of age in primiparæ in giving rise to an excess of male births. He tabulates his results as follows:

AGE OF MOTHER.	Number of cases.	Sexual ratio.
17 to 20.....	80	122.2
20 to 22.....	405	130.1
22 to 24.....	369	109.9
24 to 26.....	1,138	104.6
26 to 30.....	2,049	105.5
30 to 32.....	878	112.5
32 to 36.....	1,120	119.6
36 to 39.....	676	123.1
40 and upward.....	215	131.5

and formulates the following thesis: Very young primiparæ give birth to an excess of boys; primiparæ in the first bloom of womanhood give birth to an excess of girls; later, however, as the age of the primiparæ increases the excess of male births soon reappears and rapidly increases.

Hofacker's data and the researches of *Hampe* agree with those of *Bidder* in showing that to very young primiparæ, as well as to

elderly primiparæ, an excess of boys is born. Among the offspring of 363 mothers, at ages varying from 16 to 26 years, *Hofacker* found the sexual ratio to be 121; among the offspring of 1,056 mothers, at ages 26 to 36, the ratio was 101; and among the offspring of 567 mothers at ages 36 to 46, the ratio was 111. *Hampe* tabulated 5,992 instances as follows:

AGE OF MOTHER.	Number of instances.	Sexual ratio.
Below 20 years.....	56	107.7
20 to 25 years.....	871	90.6
25 to 30 years.....	1,633	114.9
30 to 35 years.....	1,631	108.3
35 to 40 years.....	1,185	117.1
Over 40 years.....	616	124.0

We learn, therefore, that if the age of the progenitors is to be regarded as one of the causes by which sex is determined, we must take into consideration not only the relative ages of husband and wife but, in addition, the absolute age of the wife.

Goehlert undertook a statistical investigation in which the absolute age of the husband was taken into consideration as well as that of the wife. From this it appeared that the maximum sexual ratio was exhibited when the father was between the ages of 30 and 35 years. When the age of the mother is treated as the determining influence, we find the maximum sexual ratio in the offspring of mothers between the ages of 25 and 30 years. *Goehlert* believes, however, that the paternal influence is more powerful than the maternal in the determination of sex. The respective influences are compared in the following table:

AGE OF FATHER.	AGE OF MOTHER.			
	20 to 30 years.	30 to 40 years.	Over 40 years.	Totals.
25 to 35 years.....	105.76	107.87	109.14	106.6
35 to 45 years.....	102.8	105.1	105.3	104.7
Over 45 years.....	.....	104.3	103.9	109.1
In general.....	105.25	105.97	104.9	105.5

Geissler, studying the data obtainable regarding the sexual ratio during a 10-year period in the Kingdom of Saxony, ascertained that in families possessing two children or more there was a very definite distribution of the possible sex-combinations. Where there was an even number of children those families were in the majority in which the number of boys and girls was identical. If the number of children in the family is an unequal one, those combinations are most frequent in which the number of boys exceeds the number of girls by one; next in frequency are those combinations reversed to this, *i. e.*, in which the number of girls exceeds the number of boys by one. All other combinations are comparatively infrequent in proportion as the discrepancy in number between boys and girls is larger. Rarest of all are families in which the children are all of the same sex; and among these, again, the most unusual are those consisting of boys only.

This distribution of the sex-combination is believed by *Geissler* to depend upon the fact that in the first birth and all the subsequent births there is generally speaking a slight advantage in favour of the male sex. It has not been proved that the sex of the first-born exercises a determining influence on the sex of the subsequent children. It does, however, seem clear that in the case of parents who have given birth in succession to several children of one sex only, there exists some definite obstacle to the procreation of children of the opposite sex. Putting these exceptions out of consideration, there seems to exist a tendency in the later births of a series toward the procreation, more especially of that sex which has been absent or deficient in the earlier births of the series. The strength of this equalizing tendency increases as soon as it has for the first time manifest itself. It is always greater when the sex deficient in the earlier births of the series has been the male.

I have myself undertaken a statistical investigation of the births occurring in the reigning families of Europe and in the families of the leading members of the aristocracy. The necessary particulars are to be obtained from the genealogical court calendars; and it is my belief that the data obtained regarding these uppermost strata of society are comparatively free from many sources of error by which the ordinary statistics of the subject are apt to be invalidated. For 556 marriages there were 1,972 births, comprising 1,023 boys and 949 girls, and thus exhibiting a sexual ratio of 107.7.

In relation to the relative ages of the parents, the following table was drawn up:

	Boys.	Girls.	Sexual ratio.
Husband older than wife by one to five years.....	294	283	103.8
Husband older than wife by more than five and less than ten years.....	327	306	106.8
Husband older than wife by more than ten and less than fifteen years.....	190	167	113.7
Husband older than wife by more than fifteen years.....	138	113	122.1
Husband same age as wife.....	34	42	80.9
Husband younger than wife.....	40	38	105.2

From these figures we may deduce the following conclusions, which are not wholly concordant with the law of *Hofacker* and *Sadler*: When the husband is older than the wife the excess of male births among the offspring is greater than it is in the case of an average drawn from the offspring of all marriages (in my cases the difference was 111.8 as compared with 107.7). But a closer analysis shows the difference to be less simple than at first sight appears. If the husband is older than the wife by one to five years, the excess of male births among their offspring (103.8) is less than in the average of all marriages (107.7); the same is true of the offspring of marriages in which the husband is more than five and less than ten years older than the wife, though the difference here is very trifling (106.8 as compared with 107.7). It is not till we come to the offspring of marriages in which the husband is from ten to fifteen years older than the wife that the increase in the excess of male births becomes notable (113.7 as compared with 107.7); and when the husband is more than fifteen years older than the wife the excess of males is higher still (122.1).

If we arrange these data so as to show, in cases in which the husband is older than the wife, the additional influence of the absolute age of the wife, we obtain results which partially conflict with those of *Bidder*, as follows:

HUSBAND OLDER THAN WIFE.	Boys.	Girls.	Sexual ratio.
Wife's age, 15 to 20 years.....	280	287	97.6
Wife's age, 20 to 26 years.....	595	513	116.0
Wife's age, 26 to 33 years.....	74	69	110.1

Thus we see that when the wife is very young, *i. e.*, less than twenty years of age, even though the husband is older than the wife, there is among their offspring no excess of male births, but the contrary—a sexual ratio of 97.6 only. Most marked is the excess of boys in cases in which the husband is older than the wife, and the age of the wife is from twenty to twenty-five years. When the husband is older than the wife, and the wife's age lies between twenty-five and thirty-two years, the excess of male births is not so great, though still considerable.

Hence it appears that the law of *Hofacker* and *Sadler*, which cannot be regarded as fully valid in the terms in which it was originally expressed, must be modified as follows: If the husband is at least 10 years older than the wife, and the latter is at an age when her reproductive capacity is at its maximum (twenty to twenty-five years), the offspring exhibit a notable excess of male births. There is still a considerable excess of male births in the offspring of marriages in which the husband is at least ten years older than the wife, and the wife is more than twenty-five years of age. On the other hand fewer boys are born than girls as the offspring of marriages in which, although the husband is older than the wife, the wife has not yet attained the age of maximum reproductive capacity—*i. e.*, is less than twenty years of age. The excess of female births is most marked when the husband and wife are of the same age. When the wife is older than the husband there is a moderate excess of male births.

I admit, however, that the figures upon which I have based these conclusions are, like those of *Hofacker*, too few in number for the foundation of trustworthy inferences. The instances in my computation number 1,972; those in that of *Hofacker*, 1,996; but, as I have already remarked, there are reasons for believing that the data I have employed admit of the introduction of fewer sources of error.

The influence of the absolute age of the mother in the determination of sex having been statistically proved, many have inferred that this determination is not effected during the instant of fertilization, but occurs at a later stage of intra-uterine life, and is influenced by the manner in which the embryo is nourished by the maternal organism. It is suggested that elderly and immature mothers are unable to furnish the embryo with nutriment so well as those mothers who are at the age of maximum reproductive capacity, and that upon this fact depends the excess of male births

in the latter case. (We shall return to this matter — the influence of deficient nutrition in relation to the excess of male births). But the proof of the fact that the absolute age of the father has also an influence in the determination of the sex of the offspring offers a ground for opposing this assumption that the sex of the embryo is determined during intra-uterine life subsequent to fertilization, and suggests that the father also exercises a determining influence in the origination of sex during the act of fertilization.

The absolute age of the husband seems also to have some influence upon the sexual ratio. The absolute age, like the relative age, of the father appears favourable to the procreation of a greater excess of boys. Thus, *Hofacker* found in 1,193 cases, in which the age of the father was from twenty-four to thirty-six years, that the sexual ratio was 100; in 683 cases in which the age of the father was from thirty-six to forty-eight years, the sexual ratio was 114; and in 105 cases, in which the age of the father was from forty-eight to sixty years, the sexual ratio was 169.

In investigations based upon larger collections of cases *Schumann* and *Düsing* have endeavoured to determine the variation in the sexual ratio according to the absolute age of the father.

Düsing examined the statistics of births in Norway, Alsace-Lorraine and Berlin, and from the data thus obtained he compiled the following table:

AGE OF MOTHER.	30 TO 35 YEARS.			25 TO 30 YEARS.			20 TO 25 YEARS.		
AGE OF FATHER.	Boys.	Girls.	Sexual ratio.	Boys.	Girls.	Sexual ratio.	Boys.	Girls.	Sexual ratio.
15 to 30 years.....	8,525	7,887	108.1	27,389	25,843	106.0	21,560	20,330	106.0
30 to 35 years.....	23,283	21,823	106.9	23,394	23,486	103.9	7,954	7,469	106.5
35 to 40 years.....	17,885	17,070	104.7	10,272	9,838	104.2	2,426	2,416	100.4
40 to 45 years.....	7,972	7,681	103.8	3,165	3,058	103.5	1,154	1,100	105.0
Over 45 years.....	4,220	3,997	105.6	1,734	1,525	113.8			

In this table we find the births arranged in relation to varying ages of the fathers and in relation to mothers whose ages are tabulated in three classes, the ages of the latter being those at which they are most prolific. The table shows clearly that the excess of boys is larger at the beginning and at the end of each column. Thus, the age of the mother remaining constant, young fathers and elderly fathers procreate a larger proportion of boys than do fathers of intermediate age.

But I find in this table, which is based upon a very large number of instances indeed, a confirmation of the thesis which I stated above, for the highest sexual ratio of 113.8 is in this table found in the case of fathers over forty-five years of age who are married to mothers of ages twenty-five to thirty years; this is, as I said, the case in which "the husband is at least ten years older than the wife, and the latter is at the age at which her reproductive capacity is at its maximum."

From such figures as these, which seem to show the influence of the absolute age of the father upon the determination of sex, it has by many been inferred that the man exercises a preponderating influence upon the determination of the sex of the embryo, impressing his own sex upon it, and that the greater the sexual potency of the begetter the more powerful also is the influence exercised by the latter; that the point of first importance in this connection is the sexual capacity of the man; and that the excess of male births increases *pari passu* with the increase in the potency of the procreating male.

Two additional considerations have been adduced to demonstrate the influence of the father in determining the sex of the offspring. The first of these is a comparison of the ratio between male and female births in towns and in rural districts, respectively; and the second is a comparison between the ratio of males to females in the offspring of married and of unmarried parents, respectively.

In towns the excess of male births is smaller than it is in the country. The average sexual ratio in Prussia during the five-year period, 1875 to 1880, is given by *Düsing* as follows:

In Berlin.....	105.70
In other large towns.....	105.72
In medium sized towns.....	105.44
In small towns.....	106.17
In rural districts.....	106.62

The indisputable fact that in towns more girls are born than in rural districts is referred to the fact that in the country the husband usually enters on marriage with his virile powers completely unimpaired, whereas in towns many men only marry after they have for many years expended their best forces in irregular sexual intercourse, and thus reserve for their wives only the dregs. But, as we shall show presently, the difference between town and country in this respect is susceptible of a different interpretation.

It has also been asserted (*Horn*) that extra-conjugal sexual intercourse is favourable to the procreation of boys, the suggestion

being that the greater sexual vigour in the former case determines a preponderance of males in the offspring; but this assumption is invalidated by the statistical evidence which now accumulates, that among illegitimate offspring there is a smaller excess of boys than among legitimate offspring. *Babbage*, for instance, came to this conclusion as a result of the comparison of 1,000,000 illegitimate births with 14,000,000 legitimate births. On the other hand, the following utterance of *Ploss* appears extremely artificial: "In a country in which illegitimate births are very numerous, in which the illegitimate children are for the most part begotten by enervated debauchees, the excess of male births is smaller; but in a country in which the illegitimate births are less numerous, and in which the illegitimate infants are for the most part the fruit of love and are begotten by youthful lovers, the excess of male offspring is larger."

Next to the age of the progenitors, their nutritive condition is shown by statistical investigations to exercise an important influence in the determination of sex. The following proposition has, in fact, been established: Where the supply of nutriment is deficient, the offspring contains an excessive proportion of boys.

Ploss, in an article on "The Causes of Variations in the Sexual Ratio," published in twelfth volume of the "Berliner geburtsh. Monatsheft," has collected a number of statistical data to demonstrate that the determination of sex is principally dependent upon the nutritive condition of the mother. In his opinion the determination of the sex of the embryo depends neither upon the quality of the ovum nor upon that of the spermatozoon, nor again upon the reciprocal influences exerted by ovum and spermatozoon on one another. During the earliest time after fertilization the embryo is sexually neutral and only later, as a result of some new influence acting upon it, does it receive an impulse toward the formation either of the male or of the female sex. Among all the external conditions which are capable during this period of exercising a determinative influence the most important are the nutritive conditions, for nutrition is the most important factor in determining the form of the young animal, and most of the other outward conditions, such as light, heat, and chemical changes, affect the embryo in a mediate manner only, through the changes they are respectively capable of inducing in its nutrition and metabolism. But *Ploss* is not content with asserting that the nutritive condition of the mother is of great importance in determining the sex of the embryo; he goes further than this, and declares that it is scanty

nutrition of the mother which especially gives rise to the birth of males, whereas abundant nutrition of the mother tends to give rise to the birth of females. He refers to observations made in respect of other animals than man. *St. Hilaire* observed that among the underfed animals in menageries there was an excess of male births. *Hofacker* and *Girou de Bazaingues* have noted similar phenomena in the case of domestic animals; they found that when these were richly fed they gave birth to an excess of females, but that when they were poorly nourished they gave birth, on the contrary, to an excess of males. Among sheep, with whom the number of male and of female births is approximately identical, *Martegoute* found that those animals which had given birth to female lambs had on the average a greater weight than those ewes which had given birth to male lambs. During the period of lactation, also, the former lost weight more than the latter.

When *Ploss* had further ascertained that among those engaged in the fur-trade it is the established belief that from fruitful regions the skins chiefly of female animals will be obtained, but from barren regions, on the other hand, among the skins obtained those of male animals will preponderate, it appeared to him that he was justified in drawing the conclusion that among the mammalia a well-nourished mother, one capable of providing abundant nutriment for her offspring, is, on the whole, more likely to give birth to a female than to a male, and conversely. He then endeavoured, by reference to the statistics of population, to show that in the case of human beings also, when the mother is exceptionally well nourished, there is especial likelihood of a girl being born; whereas when the mother is ill nourished she is more likely to give birth to a boy—odd as it may seem, at first sight, that a rich diet should determine the production of the so-called less powerful sex, the female; and conversely. (*Ploss*, be it noted however, denies that male newborn infants are more powerful than female.) The fact that in the country, comparatively speaking, many more boys are born than in towns (*vide supra*) is explained by *Ploss* as dependent on the fact that townswomen are on the whole better nourished than the countrywomen, owing to the greater consumption of meat by the former.

The circumstance again (likewise alluded to above), that in the case of illegitimate births almost always the excess of male births is less marked than in the case of the offspring of legal unions, is regarded by *Ploss* as offering further proof of the influence of

nutritive conditions upon the determination of sex. Illegitimate mothers are on the average women at the very best age for child-bearing, women who have worked vigorously, are themselves well nourished, and are therefore better able to nourish their unborn offspring than (on the average) married women. Further, it is a remarkable fact that in Saxony, regions of which the elevation above the sea-level is less than 1,000 feet, produce comparatively more girls than regions at an altitude of 1,000 to 2,000 feet above the sea. This *Ploss* refers to the worse nutrition of the women living at the higher altitude, for the fact is well known that the higher we go above the sea the less fertile is the soil and the more limited is its produce.

Starting from the view that the lower classes of the population are in good years better nourished than they are in bad years, *Ploss* compared statistically the rise and fall of the prices of foodstuffs, in Saxony, with the variations of the sexual ratio in the same kingdom; and he found, in correspondence with his theory, that in bad times there was a greater excess of male births than there was during periods in which food was cheaper. Moreover, the consumption of meat appeared to have more influence upon the variations in the sexual ratio than was exercised by the consumption of vegetable food-stuffs. *Ploss* endeavoured to show graphically that with an increase in the price of provisions there corresponded an increase in the excess of male births, and *vice versa*.

That after times of great wars, pestilence, and emigration, in which the male portion of the population has been decimated, there occurs a notable increase in the excess of male births, is explained by *Ploss* by the assumption that in consequence of the deficiency of male labour, the general supply of provisions is deficient, just as it is after years of bad harvests; hence, in consequence of the scanty nutrition of the mothers, the number of female births is depressed and the number of male births increases. Those countries which in general possess a more thriving population, such as Saxony, England, Belgium, Prussia, etc., exhibit a smaller excess of male births when compared with those countries in which a more widespread poverty exists, such as Russia, Lombardy, Bohemia, and even France. With increasing prosperity, fruitfulness increases, and there is an increase also in the proportion of female births.

These views of *Ploss's* are, however, rightly contested by *Breslau* and *Wappaeus*.

Breslau ("The Causes of the Determination of Sex") offers in the first place theoretical objections to the view that nutritive conditions in the mother are determinative in the production of the sex of the offspring; and he then proceeds to quote statistical data which are opposed to any such theory. He rightly insists, in the first place, that, inasmuch as it is unquestionable that in the act of fertilization the spermatozoon induces in the ovum certain changes, the effect of which is manifested in days far later than those of intra-uterine life, by the production of the most manifold and various somatic and psychical resemblances to the father, it is obvious that this single occurrence of the fusion of the spermatozoon, the bearer of the paternal influences, with the ovum is competent to induce in the ovum a molecular arrangement upon which the determination of sex may be supposed to depend—it is not necessary to suppose that for this determination, repeated actions, or a prolonged period of time, is requisite.

In this connection a reference to birds is instructive, for in this division of the animal kingdom we seem absolutely compelled to assume that the sex of the offspring is irrevocably determined in the moment of fertilization. "In birds, who lay an egg every day, eggs which are kept all at the same temperature during the period of incubation, and some of which develop into cock and others into hen birds—how is it possible to imagine that the nutritive condition of the parent is determinative of the sex of the offspring, since this nutritive condition cannot reasonably be supposed to change to any notable extent from one day to the next and then back again?"

The paternal influence in the determination of sex is regarded by *Breslau* as likely to be at least as important as that exercised by the mother. Unquestionably the semen is subject to certain variations in quality and in quantity, and it is possible that these variations may make themselves felt in the subsequent development of the embryo. Of the semen, as of all secretions, we can assume with some probability that in certain conditions (conditions which are, indeed, but little understood), it may exhibit a greater or less intensity in its stimulating qualities, and that in this way it may be subject to changes, according to which it will tend to influence the development of the embryo, now in the female, and now in the male direction. Again, in view of the continued interchange of nutritive materials between the embryo and the maternal organism,

it is probable enough that the constitution of the maternal organism and likewise that of the ovum, at the moment of fertilization, are not matters of indifference to the determination of sex. But to attribute to the nutritive condition of the maternal organism the sole or even the principal influence in the determination of the sex is an unjustifiable assumption.

The proofs alleged by *Ploss* from the animal world in support of his thesis, viz., that in the case of poorly nourished animals there is a marked excess of male offspring, are justly controverted by *Breslau* with the remark that the observations on animals are but few in number, and further that we know nothing whatever regarding the normal sexual ratios among the offspring of such animals as lions, tigers, hyænas, bears, etc., in the free state.

If, again, domestic animals when well nourished give birth to an excess of female offspring, and when ill nourished and overworked to an excess of male offspring, in the former case we can only regard the excess of female births as a pathological phenomenon, inasmuch as a superabundant supply of nutriment is not that which furnishes the highest powers or is most suited to the preservation of life. Again, the accounts given by fur-dealers are quite untrustworthy, since these men commonly obtain their goods at third and fourth hand; moreover, most of the animals whose pelts form articles of commerce, are beasts of prey, such as the otter, the lynx, the bear, the wolf, the fox, etc.—and these animals have no “pasturage.” Among vegetable-feeding animals the females are no doubt found on the pasturage more often than the males, for the reason that the females have to nourish both themselves and their young, whereas the males, which have themselves only to provide for, are contented with less food and inhabit chiefly more retired and less fertile regions; they are also shyer and are less easily shot and trapped. Regarding statistical data relating to the influence of nutrition on the production of boys, *Breslau* shows, from the figures of the Canton of Zurich, that with few exceptions, the years in which the price of corn was lowest were the years in which the production of boys was greatest, and *vice versa*—the exact opposite of the results obtained by *Ploss* from his examination of the figures relating to births and the price of provisions in Saxony.

Wappaeus contests the conclusions of *Ploss* even more vigorously, and adduces the statistics of Sweden in the 20-year period 1770 to 1790, in which period this kingdom repeatedly suffered from

famine in consequence of failure of the crops, so that the births and deaths were largely affected. It appeared, however, that the more abundant or more scanty nutrition of the inhabitants of Sweden during this period had no marked influence upon the sexual ratio.

If scanty nutrition of the mother had, in fact, any influence upon the determination of the sex of the embryo in the direction alleged by *Ploss*, viz., so as to bring about the birth of a greater excess of boys, this influence should be manifested with exceptional clearness in the case of twins, for it is obvious that the nutriment that is insufficient for one embryo would be still scantier for two. Hence various statistical investigations have been undertaken to determine the sexual ratio in the case of twin births. *Ploss* found that in Saxony, in the case of 23,420 twin births, the sexual ratio was 106.7 boys to 100 girls; *Moser* gives the sexual ratio in the case of twin births as 106; *Meckel von Hemsbach* gives it as 105.4; *Hecker*, 116 and 122; *Sickel*, 112.3. *Düsing* combined the figures relating to twin births in various lying-in hospitals, published by *Hecker*, *Sickel*, *Baillarger*, *Siebold*, *Elsässer*, and *Levy*, respectively, and thus obtained a sexual ratio of 121.5 boys to 100 girls. This excess of boys is notably greater than among births in general.

But other statistical data are available which show a reversed condition, viz., that in the case of twin births the sexual ratio is lower than usual. According to *von Frick's* collection of twin births in Prussia, the sexual ratio was 104.7 boys to 100 girls; whereas in the case of single births in the same country the sexual ratio was 106.35 to 100. *Riccke*, in Württemberg, in the case of 60 twin births found 58 boys and 62 girls. In the case of twin births observed by *Braun*, *Chiari*, and *Späth*, 94 in all, the children were in 64 of these of identical sexes, namely, in 30 instances boys, and in 34 instances girls. According to *Breslau*, in the case of twin births in the Canton Zurich, the sexual ratio was 104.1 to 100; whereas in the case of single births the sexual ratio was 106.2 to 100.

As regards triplets the reports of the sexual ratio vary from 111.76:100 (*Meckel von Hemsbach*) to 104.55:100 (*Neeffe*).

It is obvious that the statistical data at present available regarding the sexual ratio in the case of multiple births are far too variable for it to be possible to base upon them any valid conclusions as to the influence of the nutritive condition of the mother upon the determination of the sex of the offspring. And taken as a

whole the statistical data hitherto available do not enable us to infer with confidence that nutritive conditions, and more especially the nutritive state of the maternal organism, exercise any effect upon the determination of the sex of the offspring.

Another attempt at the utilization of statistics has been to ascertain whether the time of fertilization in relation to menstruation, (in the first days after the flow, or later in the intermenstrual interval) has any influence upon the determination of sex. The starting point in this investigation was the earlier view that sex depends upon the state of the ovum, and the belief that a very favourable state of ovum and sperm favours the production of the female sex. The ovum, after its discharge from the ovary, like the spermatozoon after its discharge from the testicle, tends sooner or later toward death, and the only thing that can save either from this ultimate fate, is for the two to unite to form a new organism. Precisely what moment in the history of the detached ovum is the most favourable, is a matter regarding which we have no exact information, but it is probable that at the moment of its discharge from the ruptured follicle, it is at the zenith of its vital powers. On this theory the determination of sex depends upon the period at which, after its liberation from the follicle, the ovum encounters a spermatozoon; the ovum which is fertilized early in its career becomes a female embryo; the ovum, on the other hand, which is not fertilized until it has become comparatively old, becomes a male embryo. But, as *Hensen* points out, a spermatozoon, according to *its* condition, may either fail sufficiently to fortify an ovum which itself is in good condition; or, on the other hand, a powerful spermatozoon may fortify an ovum of deficient vitality. But it is difficult to say precisely on what considerations the greater or less vitality of the spermatozoon depends — or, to speak more in accordance with the terms of the theory, we do not know exactly what makes it a good spermatozoon or the reverse. It may be “bad,” either because it has remained too long in the testicle or because it has been discharged too quickly, is too recently secreted; moreover, a long sojourn of the spermatozoon in the uterus will doubtless suffice to lower its vitality.

The Jews, more especially, whose religious ordinances forbid them to have sexual intercourse either during or shortly after menstruation, and among whom there is a great excess of male births, have been adduced as a proof of the thesis that sexual intercourse

during the later part of the intermenstrual interval tends to favour the procreation of boys. In Leviticus xv. 19, we read: "And if a woman have an issue, and her issue in her flesh be blood, she shall be put apart seven days." From the commentary in the Talmud it appears that these seven days are to be reckoned from the commencement of the flow. Statistical reports from various countries show that among the Jews there is a greater excess of male births than among the other inhabitants of the respective countries. The overplus of male births exhibited by the Jews varies from 1 to 15%, the difference probably depending on the fact that the number of instances under consideration is too small for uniform results to be possible. In Prussia, during the period 1820 to 1834, the sexual ratio among the Jewish births was 111:100; during the period 1849 to 1852 it was 106:100; in Hungary during the period 1835 to 1855 it was 117.1:100; in Sweden, 1851 to 1855, it was 108:100. Among illegitimate children of the Jewish community the sexual ratio was, in Austria, 123.9, in Prussia, 118.6.

Fürst, examining the cases in *von Braun's* clinic, and making a statistical collection of the days of conception and of delivery, has endeavoured to prove that "there is an excess of boys when conception occurs during the period of post-menstrual anæmia." His figures show, in fact, a very notable excess of boys in cases in which conception has occurred during the five days immediately following the cessation the menstrual flow; and an excess of girls when conception has occurred during the later part of the intermenstrual interval. Thus, in the former case the excess of boys is represented by the figures 37:12; in the latter case the excess of girls is represented by the figures 79 (girls) : 65 (boys). These figures are explained by *Fürst* on the theory that in the human species conception during the period of post-menstrual anæmia probably leads to an enormous excess of male conceptions (owing to the fact that the unfertilized ovum is badly nourished during the days just before conception); whereas in the later part of the intermenstrual interval the better nourishment of the ovum probably leads to the procreation of an excess of girls—hypotheses which are based on a quite inadequate number of instances. *Fürst* gives the following table:

NUMBER OF DAYS BETWEEN REPUTED END OF MENSTRUATION AND REPUTED OCCURRENCE OF CONCEPTION.	Number of boys born.	Number of girls born.	Boys and girls together.
1.....	7	1	8
2.....	6	3	9
3.....	9	5	14
4.....	15	3	18
5.....	3	6	9
6.....	5	6	11
7.....	6	5	11
8.....	2	8	10
9.....	4	5	9
10.....	6	4	10
11.....	6	5	11
12.....	3	6	9
13.....	4	5	9
14.....	6	5	11
15.....	1	2	3
16.....	2	5	7
17.....	2	3	5
18.....	3	.....	3
19.....	1	3	4
20.....	1	2	3
21.....	1	1	2
22.....	4	1	5
23.....	.....	1	1
24.....	1	.....	1
25.....	.....	2	2
26.....	2	.....	2
27.....	.....	1	1
28.....	1	1	2
31.....	1	.....	1
	102	91	193

Baust gives a report, based, he says, upon "thoroughly trustworthy data," furnished by personal friends, regarding 14 cases, which show, in his opinion, that every conception occurring in a week after the cessation of the menstrual flow leads to the birth of a girl; but that when conception occurs on the fifth or sixth day after menstruation the result varies as regard sex. *Swift*, from a report of 20 cases, draws the conclusion that in the intermenstrual interval, boys, in the latter part of the interval girls are conceived.

The influence of the strength of menstruation upon the determination of sex has also been studied by the statistical method, starting with the idea that menstruation, in proportion to its strength, affords on the average a measure for the subsequent nutrition of the embryo, and this nutrition is further supposed to determine the

sex. *Düsing* therefore arranged the births occurring in the lying-in hospitals of Dresden, Leipzig and Jena, according to the information given regarding menstruation in the clinical history of each case; it appeared that when menstruation was comparatively scanty, there was a greater excess of boys than when menstruation was comparatively abundant. The actual figures were the following:

	Abundant menstrua- tion.		Scanty menstrua- tion.	
Dresden.....	902	847	495	431
Jena.....	66	69	56	45
Leipzig.....	21	22	239	211
Totals.....	989	938	790	687
Sexual ratio.....	105.4		114.7	

Here also we may append the figures obtained by *Düsing* regarding the births of foals at the Prussian stud-farms, which he regards as supporting his view that by natural selection all animals have acquired the faculty, whenever stronger demands are made upon their sexual capacity, of procreating a larger number of individuals of their own sex. In the tables we learn how many mares on an average a stallion had covered in each year, that is, we learn how great were the demands made upon the sexual capacity of the stallion in that particular breeding stable in that year. The figures relating to the years 1859 to 1892 were tabulated and averages were drawn with the following results:

NUMBER OF MARES SERVED.	NUMBER OF FOALS BORN.		Sexual ratio.
	Colts.	Fillies.	
60-70.....	42,445	41,933	101.22
55-59.....	56,511	66,226	100.49
50-54.....	59,940	61,096	98.18
45-49.....	57,077	59,216	96.39
40-44.....	59,967	62,007	96.71
35-39.....	38,348	40,181	95.44
20-34.....	26,354	27,069	97.35

From these figures, which relate a very large number of instances indeed, we learn that when greater demands are made upon the stallion, more males are procreated. In fact, except for two slight divergencies, the rise in the sexual ratio proceeds strictly *pari passu* with the increase in the number of mares covered.

I must, however, draw attention to the fact that this assumption when applied to the human species, that the man on whom whose sexual capacity especially extensive demands are made, procreates an especially large number of male children, is not confirmed by the sexual ratio among the offspring of polygamous marriages in which unquestionably greater demands are made upon the husband's sexual powers than is the case in monogamic unions.

The reports of travellers of earlier days, to the effect that in Oriental countries more girls are born than boys, have recently been confirmed by several observers. *Campbell* states that in the harems of Siam the number of boys and girls born is equal. *Clarke* states that among the Mohammedan Indians more girls are born than boys. According to *McLennan* Indian experience teaches us that where polyandry prevails male offspring predominate in numbers; but where polygamy prevails there is, on the contrary, an excess of female infants. The following data collected by *Gochlert* from historical reports and from genealogical writings, regarding the progeny of notable persons living in polygamous unions, show certainly a large excess of female offspring over male:

	CHILDREN.		Sexual ratio.
	Male.	Female.	
Morocco: Muley Scherif.....	24	124	19.4
Palestine: Rehoboam, King of the Jews.	28	60	46.6
Arabia: Imon of Sana.....	14	74	18.9
Turkey: nine sultans.....	110	128	85.9

According to *Tousencl*, love marriages give rise to more daughters than sons, whereas among the offspring of conventional or compulsory marriages, male children predominate. Further, among the offspring of legitimate unions, the excess of males is greater than among the offspring of illegitimate unions. A physician, *V. J. Cook*, maintains that boys are procreated in the evenings (before

midnight), but girls during the early morning hours—at which latter time women are less “impressionable” than during the evening hours.

Düsing, starting from the common belief that all animals have the faculty, when there is a lack of individuals of one sex, of procreating an excess of offspring of the sex which is deficient and thus of restoring the balance between the sexes, maintains that numerous factors, through the co-operation of which the sexual ratio is regulated, act in temporal succession. He shows that the individuality of the mother has an influence upon the sex. But this finds expression through the qualitative constitution of the ovum; hence already before fertilization there must exist a tendency toward the development of one sex or the other—for example, younger ova tend to become females; older ova, on the contrary, to become males. It has further been shown that the individuality of the father, that is to say, the qualitative constitution of the sperm, has an influence in the determination of sex. Thus, by means of the influence of the sperm, the already-mentioned pre-existing tendency of the ovum can in some instances be counteracted and overpowered. The influences in the personality of the father and of the mother, which during fertilization find expression in the qualitative constitution of the sperm and of the ovum, respectively, can thus bring about a resultant tendency, acting in one direction or the other with varying force. Thus, after fertilization, we have this resultant tendency toward the formation of a male or female embryo.

But, *Düsing* continues, at this time the sex is not definitely determined. The influence of the nutritive condition in which the fertilized ovum finds itself has yet to make itself felt. This influence on the determination of sex through the maternal nutrition, continues (in the human embryo) for as long as three months, but even when the reproductive organs of the embryo have definitely begun to diverge in the direction of the masculine or the feminine type, as the case may be, some nutritive influence, if it is sufficiently powerful, may yet turn the balance in the other direction, so that a partial or complete hermaphrodite results, a being uniting the characteristics of both sexes.

Actual inheritance of sex, of which people used to speak, cannot, in *Düsing's* opinion, possibly occur. The mode in which one sex or the other develops is indeed inherited; but the decision which sex shall develop does not depend upon inheritance, but is deter-

mined by the co-operation of several outward influences. The qualities by which this is effected are acquired by adaptation to general or special vital conditions.

Wilckens ("A study of the Sexual Ratio and of the Causes of the Determination of Sex in Domestic Animals") opposes the views of *Düsing*, on account of the results of his own investigations, relating to the births of 30,000 domestic animals. He formed the following conclusions:

1. *Locality* (soil and climate) has an influence upon the sexual ratio and upon the determination of sex in domestic animals, but this influence is probably indirect only, being exerted through the intermediation of the nutrition of the embryo *in utero*.

2. The *season* in which the domestic animal is conceived affects the sex; the hot season favours the production of males, the cold season that of females; in the hot season, in general, the appetite and nutrition of domestic animals diminish, whereas in the cold season these increase.

3. Regarding the *male progenitor*, neither his age, nor his sexual energy, nor the demand made upon that energy, nor the age of the semen, has any influence upon the sexual ratio or the determination of the sex of the offspring.

4. The age of the *female progenitor* influences the sexual ratio and the determination of the sex of the offspring in this way, that in general, primiparæ and young mothers conceive a larger number of female offspring. This influence of age may be referred to the fact that in general young mothers nourish their offspring *in utero* better than older mothers.

5. The *nutrition of the fruit in utero* influences the determination of sex, speaking generally, in the following way, that better nutrition favours the determination of the female sex, worse nutrition favours the determination of the male sex.

6. In addition to the influence of nutrition of the fruit upon the determination of sex, *other influences*, whose nature still remains *obscure*, must also co-operate, because one and the same progenitor in similar nutritive conditions does not always procreate offspring of the same sex.

7. Owing to the operation of these *unknown influences*, prediction of the sex of the offspring, and voluntary determination of the sex of the offspring, remain impossible. All we can say is that there is some probability that young and well-nourished mothers will procreate a comparatively larger number of female offspring,

whilst elderly and ill-nourished mothers will procreate a comparatively larger number of male offspring.

II. Anatomical Investigations.

Of anatomical investigations and discoveries, those more especially relating to the sex-relationships of twins and triplets have been applied to the elucidation of the problem of the determination of sex.

The first and most important fact in this connection, one that is not merely a rule confirmed again and again by anatomists and gynecologists, but is further, as *Mayrhofer* has demonstrated as a result of his researches in *von Braun's* clinic, a "natural law," is this, that twins and triplets enclosed in a common chorion are invariably of the same sex. The sex-identity of such twins has been referred to the similarity of their nutritive conditions (*Leuckart, Ploss*), and more especially to the communication between their bloodvessels; and an intimate connection between these relationships and the determination of sex has been believed to exist.

Mayrhofer, however, opposes this assumption by the following deductions ("The Determination of Sex in the Human Species"); "Fœtuses enclosed within a single chorion always possess a common placenta, in which the blood-channels from both umbilical cords frequently, in the case of twins perhaps invariably, communicate. It might therefore be supposed that the sex-identity of embryos enclosed within a single chorion is due to the intermixture of their blood in the placenta. *Hyrthl*, however, describes a triplet's placenta, in which, though all three fœtuses were enclosed within a single chorion, the vessels passing to the umbilical cord of one of the fœtuses were entirely distinct from the vascular area common to the two other fœtuses; it is therefore probable that in the case also of twins enclosed within a single chorion there is not *necessarily* any communication between their bloodvessels in the common placenta. But even if it were proved that in the case of twins enclosed within a single chorion their bloodvessels always do communicate in the common placenta, we could not therefore infer that the intermixture of the blood of the two fœtuses is the cause of their sexual identity.

"For the intermixture of the blood of the two fœtuses in the common placenta could never lead to a complete identity in the composition of the blood of the two; it could only lead to a dimi-

nution of the differences which would exist between the bloods if their placental circulations were entirely distinct, and the similarity in the bloods thus established could not be expected to do more than make it a general rule that such twins or triplets should be of the same sex; but to this rule exceptions might be expected to occur in certain cases, as when hæmatopoiesis in the two (or three) fœtuses was very different, or when the circulation through the intercommunicating bloodvessels was interfered with through the pressure of fibrinous deposits—differences between the bloods would then arise sufficient to cause differences in sex (if identical composition of the bloods is presumed to be the cause of the sexual identity).

“Experience teaches us that the existence of communicating vessels in the placenta does not suffice to induce a close similarity of growth and of the formation of the organs in twin fœtuses; nor does it prevent the illness and death of one fœtus leaving the health of the other undisturbed, although the communicating channels remain open; so that, if we except acardiac monsters, it is correct to say that each fœtus pursues a secluded life, uninfluenced by the life of its neighbour. Acardiac monsters, on the other hand, always receive blood which has already served for the nutrition of the normal fœtus, and the result of this is an arrested development and a striking preponderance of connective tissue in the acardiac twin. But notwithstanding the fact that the failure of its own proper circulation (which is indeed rendered possible by the existence of the communicating vessels in the placenta) leads to its defective nutrition with a blood inferior to that supplied to the normal fœtus, the acardiac monster is always of the same sex as the normal twin.”

From these considerations *Mayrhofer* rightly infers that the identity of sex of two fœtuses contained in a single chorion, since it does not depend upon the existence of communicating vessels in the placenta, must arise from a developmental tendency already existing in the two germs at the time of conception—or, in other words, that at the time of conception their sex is already inalterably determined.

This conclusion with respect to the sex of twins contained in a single chorion may very readily be extended to the inference that in the case of all human fœtuses the sex is already determined at the time of conception.

Another anatomical fact is that many twins are contained in a

single chorion for this reason, that they originate from two germinal vesicles within a single ovum. It is an open question whether it is not possible for two embryos contained in separate chorions to come to lie in a single chorion through atrophy of the intermediate wall. If this is indeed possible, the invariable identity of sex in the case of fœtuses lying in a single chorion must lead us to agree with *Mayrhofer* in inferring that two ova lying within a single follicle, simultaneously fertilized, give rise to embryos of identical sex.

B. S. Schultze and *Ahlfeld*, as a result of the investigations regarding twins, also came to the conclusion that the sexual identity of twins depends upon their derivation from a single ovum. If, in accordance with what has been said above, an explanation of the sexual identity of certain twins is to be found in the fact that for such twins there has been a single conception only, and hence the influence, whatever it may be, by which sex is determined acts on both germs at the same time—still the sexual identity of twins in general is remarkable and has not yet been fully explained. The sexual identity in fact occurs much more frequently than appears to correspond to the percentage of twins derived from a single ovum. *Von Fricks* examined the data relating to multiple births in Prussia during the period of 1826 to 1879 and compiled the following table:

PER CENT.	Twins.	Triplets.	Quadruplets.	Quintuplets.
Boys only.....	32.6	24.5	14.3	33.3
Girls only.....	30.3	22.5	19.4	.....
Boys and girls.....	37.1	53.0	66.3	66.7
	2 B. 1 G. 1 B. 2 G.	28.5 24.5		
		2 B. 2 G. 3 B. 1 G. 1 B. 3 G.	23.4 19.5 23.4	
			4 B. 1 G. 3 B. 2 G.	33.3 33.3

According to *Ahlfeld*, of twin births in general, the ratio of those with a common chorion to those with separate chorions is 1:8.15. If, however, we wished to explain the frequency with which twins

are of identical sex from the occurrence of such twins derived from a single ovum, we should expect to find a very different ratio, namely, 1:3.84; that is to say, twins with a common chorion would have to be nearly three times as common as they actually are. From these facts *Düsing* endeavours to draw the conclusion that external conditions have an influence upon the determination of sex, for very many external conditions are identical in the case of twins; as, for instance, the age of the father, the age of the mother, the nutritive conditions of the ova and of the spermatozoa, the nutrition of the embryo, etc.—all of these would influence both the twins in the same direction. A difference in the sex of twins, on the other hand, might be due to two successive fertilizations.

B. S. Schultze has been led by his embryological studies to the conclusion that there are male and female ova. Thus he believes that sexually identical twins originate from a single ovum with two germinal vesicles, thus assuming that a double fertilization of such ova is possible. But since in such cases the sexes of the resulting twins are always identical the spermatozoon can have no influence upon the determination of sex, but the conditions leading to the development of one sex or the other must pre-exist in the ovum—*i. e.*, there must be male and female ova.

That as a matter of actual fact in some cases the female progenitor exercises an overwhelming influence on the determination of sex, and that the opinion held by so many that this determination depends upon the mother alone is sometimes supported by facts, is shown by the incident recorded by *Darwin* ("Descent of Man," Vol. I.), that an Arab mare was delivered seven times successively of a filly, never of a colt, although she was covered by seven different stallions. On the other hand, the circumstance, if it is not to be attributed to pure chance, can also be explained by the constitutional vigour of this mare (*Hensen*) without adopting the above hypothesis.

Recently *Upjohn* has maintained that there are two kinds of spermatozoa, male and female; the latter are the commonest, but the former are the more energetic.

An interesting anatomical fact bearing upon this question has been discovered by *M. Nussbaum*, namely, that in *ascaris megalocephala* the reproductive glands are indicated already before the separation of the germinal layers; and *Nussbaum* suggests that this is also the case in all animals, although the proof cannot be obtained in every instance.

Semper has shown also in the case of some of the plagiostomata that long before the beginning of the definitive development of the reproductive organs, the apparently hermaphrodite embryo already possesses at least the tendency toward the constitution of one sex or the other. For in these animals, at a time so early that as yet the reproductive glands exhibit no sexual differentiation whatever, the sexes can nevertheless be distinguished by what appears to be a secondary sexual character. In the female, namely, one ovary only is developed; and very early indeed in the embryos destined to become females we can observe an asymmetrical development of the two germinal furrows. By this characteristic the two sexes can be distinguished far earlier than it is possible to do so by the recognition of a histological differentiation of the reproductive glands.

According to *Mayrhofer* the prepotency of the male gives rise to the procreation of an excess of males in this way, that physical prosperity of the male probably leads to the generation of boys, whereas prosperity of the female tends to give rise to the generation of girls. Moreover, economizing of the semen by infrequent sexual intercourse tends to originate offspring of the male sex. In this connection *Hensen* remarks, apropos of the greater excess of male offspring among the Jews: "We might ask whether, in consequence of the comparative sexual continence of the Jews which demands a definite power of endurance on the part of the ova, there may not be effected a certain selection of the ova; and thus we may perhaps explain how it is that in this race an exceptional vigour is somewhat more often to be observed than in other races." *Bock* assumes that "thinner semen," such as results from more frequent sexual intercourse, favours the procreation of the female sex, whereas when intercourse is less frequent a larger number of boys is likely to be born. *Janke* indicates as two important fundamental principles of scientific physiology that, (1) sexual intercourse represents as it were a contest between the two parties to the sexual act as to which shall transmit his or her sexual influence to the child, the victor in the contest determining the sex of the offspring, and (2) that a crossed inheritance occurs, inasmuch as whichever progenitor proves stronger in this contest transmits to the child the sex other than his or her own. He therefore advises women who long to have a boy to drink a glass of champagne before fulfilling their conjugal duties in order to gain increased sexual vigour.

Fiquet also expresses the opinion that when a vigorous, passion-

ate, and sanguine male progenitor has intercourse with a frigid and phlegmatic woman there will be a preponderant tendency for the offspring to be female; whereas, when the conditions are the opposite of these, the male progenitor being phlegmatic and cold, the female on the contrary sanguine, passionate, and ardent, the offspring will probably be of the male sex.

In opposition to these opinions of *Fiquet* and *Janke*, to the effect that the temperament and the sexual vigour of the progenitors have a determining influence in the origination of the sex of the offspring, *Düsing* insists that the quality of the reproductive products are alone influential. *Düsing* lays down the following proposition: "The greater the scarcity of individuals of one sex is, the more extensive consequently the demands made upon the sexual capacities of the individuals of that sex, the more rapidly their reproductive products are employed; and the younger these products therefore are when employed the more individuals of their own sex will appear among the offspring."

Richarz believes, on the contrary, that the prepotency of the male gives rise to the procreation of more girls; a mother of high reproductive capacity will have more boys, one of less reproductive capacity, on the other hand, more girls.

Starkweather ("The Law of Sex," London, 1883) states his view in the proposition: "The superior parent produces the opposite sex;" and he holds the quaint view that this superiority is displayed in certain anatomical characters of the face of the progenitor. He endeavours from the shape of the head and from the facial expression to deduce the superiority of the male and the female progenitor respectively. A high, square forehead, with prominent supra-ciliary ridges, constitutes, according to *Starkweather*, one of the principal symptoms of this superiority; important also are a strongly developed middle third to the nose, narrow lips, etc. He declares that in families known to him the possession of this Roman nose in the father is signalized by the possession also of a large number of daughters, while a Roman-nosed mother has many sons. The more the parents' noses resemble each other the more equal will be the distribution of the sexes among the offspring. He connects this fact (!) also with the fact that the possessor of the aquiline nose is the ruler of the family. Men of great strength of character procreate chiefly daughters; women, on the other hand, with a powerful character and a firm will bring into the world a notable excess of boys. In the Southern States of the American

union *Starkweather* found confirmation of his theory, since he observed there that among the offspring of white fathers and coloured mothers there was an excess of girls amounting to 12 to 15 per cent. Among the half-castes of Java, the so-called Liplapps, in the third generation girls only are born, and these are sterile. The excess of girls in these cases depends upon the superiority of the white father; this superiority is transmitted to the few sons of the second generation, and these therefore procreate girls only to constitute the third generation; the latter are not powerful enough to bear children at all.

Roth has revived the old view that one ovary provides the germs for the male offspring, the other those for the female offspring. He believes further that in the process of cohabitation the mechanical impressions and stimuli received by one-half of the external genital organs, reinforced by contact with and pulling on the pubic hair, are transmitted through the pudic nerve and the hypogastric plexus to the corresponding half of the vagina and the uterus, to the Fallopian tube of that side and to the corresponding ovary. If, now, we can consider it as established (?), that in the human female one ovary discharges male ova only and the other female ova only, it seems to him that it is the corresponding half of the external genital organs, when specifically stimulated in sexual intercourse, and the consequently increased vital activity in the pudic nerve and its connections with the hypogastric plexus, that must be regarded as the organ by means of which sex is determined. *Roth* has also been informed by laymen that when for some time they have procreated daughters only they subsequently procreated sons, "when, having been accustomed to sleep on one side of their wife, they adopted the practice of sleeping on the other."

Ricardi reports that in Modena the peasants say that a man whose wife has hitherto had daughters only, must, if he wishes to have a son, assume some other posture than usual in the performance of coitus.

III. Experimental Investigations.

A considerable number of years ago, *Thury* attacked the problem of the determination of sex by the experimental method. In his series of experiments he ascertained, using 29 cows, that in the case of 22 of these, which were served early in their heat, the calves were without exception heifers, while in the case of the remaining 7, which were served late in their heat, the calves were equally

without exception bull-calves (*Thury*, "The Law of the Determination of the Sexes," Leipzig, 1863); in the record of these experiments no mention is made of the age of the cows. *Thury* concluded that the sex was determined according to the fertilization of the ovum soon or late after its liberation from the ovary; namely, that an ovum fertilized soon after its discharge produced a female, whilst an ovum which had become comparatively old before it was fertilized became a male.

Thury's sensational experiments gave rise to a succession of similar experiments, made mostly by cattle-breeders, above all in agricultural colleges and in stud-farms.

Some of these experiments were made in the agricultural colleges at Proskau and Eldera. The cows, which according to *Thury's* views should have been delivered of heifers, were served as soon as their heat was observed (the heat lasted as a rule from 24 to 30 hours); these were delivered of 5 heifers and 5 bull-calves (in Proskau) and of 3 heifers and 5 bull-calves (in Eldera); the sexual ratio in these cases was therefore normal. On the other hand, cows which were not served until their heat had lasted for 20 hours were delivered (in Proskau) of 1 heifer and 4 bull-calves.

Further experiments (in Waldau) gave the result that cows served early were delivered of 1 heifer and 1 bull-calf. In another series (in Eldera) 9 cows served as soon as heat was observed (or, speaking strictly, in from $\frac{1}{2}$ to $1\frac{1}{2}$ hours of this), gave birth to 7 heifers and 2 bull-calves.

Experiments made at the Royal Friedrich Wilhelm Stud-Farm gave the following results: In the case of 20 mares, which if *Thury's* theory had been correct should all have given birth to fillies, 11 only fulfilled this expectation; but 10, on the other hand, were colts. *Touchon*, in his experiments at Hohenhau, obtained 11 calves and 2 foals, exhibiting the sex expected in accordance with *Thury's* theory.

Düsing made a compilation of the figures given in all the experiments made to test *Thury's* theory, with the following results: Cows fertilized early were delivered of 13 bull-calves and 29 heifers; mares fertilized early were delivered of 10 colts and 13 fillies; cows fertilized late were delivered of 5 bull-calves and 2 heifers.

Gerbe made experiments on rabbits, putting the buck to some doe-rabbits soon after the beginning of their heat, but to others as late as possible in their heat. On examining the young in the horns of the uterus, from the ovary downward, the distribution of the sexes was found to be approximately equal.

Whilst *Coste's* experiments on a hen gave results contradictory to *Thury's* theory, *Albini's* experiments, made also on the common fowl, gave results in agreement with that theory. He found that the hens began again to lay fertilized eggs 3 to 6 days after intercourse with the cock (from which they had previously been kept separate); on the average, the distribution of the sexes in the chickens hatched from these eggs was approximately equal, with, however, a slight preponderance of cock birds. On the ninth and tenth days after separation from the cock the eggs laid were half fertilized and half unfertilized; on the twelfth day after separation from the cock the unfertilized eggs were in a great majority; but even as late as the eighteenth day after separation some of the eggs laid were still fertilized. The fertilized eggs laid from the tenth to the fifteenth day after separation when incubated produced a great preponderance of hen birds.

We have to thank breeders for a large number of experiments, such as those made by the breeder *Fiquet*, at Houston in Texas, who found that a bull upon whose sexual capacities excessive demands were made, procreated bull-calves exclusively; whereas in herds containing numerous bulls there were found among the calves born a preponderance of heifers. In thirty experiments on cattle *Fiquet* always found that the larger the number of cows a bull had to serve, and the longer they were kept in service, the larger was the proportion of bull-calves among their offspring. On the other hand, if certain cows had their sexual desires first satisfied by a gelded animal and were then served by a vigorous and lusty bull, an excessive proportion of heifers was born to these animals.

Janke obtained similar results in the breeding of sheep. In a report made to *Düsing* he states that in the early part of the lambing season more ewe-lambs are born than rams; in the latter part of the lambing season, on the contrary, more rams than ewes. The explanation he gives is that at the commencement of the pairing the rams are fresh and lusty, whilst later their potency is comparatively exhausted. In stud-farms, according to the same observer, it is a familiar experience that the most vigorous stallions serving a mare in the morning commonly procreate a filly; but if later in the day they serve a second mare they almost always procreate a colt. This, he thinks, finds its explanation in the fact that the stallion, when he serves the second mare, is in a condition of comparative sexual exhaustion, the more so because he usually covers the first mare twice.

Maritegoute's breeding experiments at the sheep-farm of Blanc (Haut-Garonne), on the other hand, gave divergent results. In the early part of the pairing season, as long as the ram's sexual powers were completely unimpaired, he procreated more male than female lambs. But when a few days later a great number of the ewes were simultaneously on heat and the ram, owing to very frequent acts of intercourse, began to be sexually exhausted, the procreation of female lambs was in excess. But when, finally, this period of maximum demands upon the ram's powers was past, and the number of ewes on heat became once more small, the procreation of male lambs in preference to female was again observed.

The data obtained by *Düsing* from the Prussian stud-farms, in which, when greater sexual demands were made on the stallions, more males were procreated, have been already mentioned.

Fiquet made interesting experiments on cows and believed that in this way he was able to demonstrate the influence of nutrition upon the determination of sex—to such a degree, indeed, that he believed it was possible to breed calves of either sex at will. The following method gave him positive results in more than thirty instances. He never had the cow served by the bull at the first heat, but only at the second (if a cow is left unserved when on heat, the heat recurs after an interval of three weeks). The interval of three weeks was utilized in the preparation of cow and bull for the copulatory act. If a bull-calf was wanted the cow was supplied with the most invigorating fodder and was kept on the richest pasture available. The bull, on the other hand, that was to serve this cow was turned out to graze on the poorest pasture and was given poor fodder. At the end of the three weeks, when the cow came on heat for the second time, its sexual appetite was as intense as possible, whereas the bull showed but slight inclination to the sexual act. If the bull now served the cow a bull-calf was procreated. The opposite procedure led to the procreation of a heifer. For this purpose *Fiquet* kept the cow on low diet during the interval between the first and second heats, and had her first served by a castrated animal. When in this way, and by the low diet the sexual appetite of the cow had been sufficiently diminished, it was served by a lusty bull, which for a long time had not been put to any cow, and the sexual potency of which had been increased to the uttermost by feeding it for several weeks on the most invigorating fodder.

The results of these experiments, according to which the nutri-

tion of the parent-animals before the copulatory act has an influence upon the determination of sex, is explained by *Düsing* in this way, that nutrition influences also the quality of the reproductive products. "Poor nutrition gives rise to diminished functional capacity of the genital apparatus. Thus, for example, the production of semen is lessened. It can, in fact, hardly be replaced as quickly as it is used up. This occurs when there is a lack of adequate means of subsistence, and also when there is a lack of comparatively young males. In both cases alike we trace the effects in the birth of an excess of males. Converse conditions give rise to an excess of female offspring."

Passing now to consider investigations made by physiologists, *Born*, at the anatomical institute at Breslau, has endeavoured to solve the problem of the determination of sex by means of experiment. He employed for this purpose *rana fusca*, an animal with which positive results can be obtained in a comparatively short period of time. He examined the sex both of the frogs in the free state (165), and also of larvæ which he had bred in specially arranged aquaria. Whereas among the frogs developing in the open, the numbers of the sexes appeared to be approximately equal (there was an excess of females amounting to 2 or 3 per cent.); among those bred in the aquaria there was an enormous preponderance of females (96 per cent.). This remarkable result is referred by *Born* to the inadequate supply of nutriment in the case of the larvæ bred by him (he fed them on hydræ and on putrefying frog and tadpole meat); from an examination of the alimentary canal of tadpoles caught in the open *Born* ascertained that their normal food was the mud of the pools in which they were hatched, containing infusoria, radiolaria, diatoms, algæ, etc. The accuracy of this explanation appeared to *Born* to be more convincingly shown by the results in the case of one of his twenty-one aquaria. In this one alone the percentage of males was as high as 28 per cent., and the tadpoles in this attained the same size as those developed under natural conditions in the open, whilst in all the other aquaria the tadpoles remained abnormally small. This particular aquarium, owing to an oversight, had pond-mud on its floor, whilst all the other aquaria were floored with clean sand.

A. von Griesheim disputes *Born's* results and believes that the latter, determining the sex of the tadpoles by means of a hand lens, must have mistaken a great many female tadpoles for males. He himself, by repeated enumerations of a large number

of tadpoles (685), part caught in the open and part taken from a large aquarium, found that the ratio between the sexes in the case of *rana fusca* was regularly 36.7 males to 63.3 per cent. females.

E. Pflüger refers the divergence between *Born's* results and his own and those of *von Griesheim* not to any error made by *Born* in the diagnosis of the sex of the tadpoles, but to the fact that in the latter's aquaria the mortality of the male tadpoles was probably greater than that of the females. *Pflüger* endeavoured to ascertain whether the concentration of the semen might have an influence in the determination of sex. A quantity of frog-spawn was fertilized with concentrated semen, taken direct from the seminal vesicles, and another quantity of spawn was fertilized with diluted semen, obtained by making an aqueous extract of the incised testicles. The ratio between the sexes in the case of the two lots of tadpoles, which were kept in separate aquaria, proved, however, to be mathematically identical. But another experiment showed that the number of males was very different, according to the kind or race from which the animals were derived. He therefore believes that for the character of the development of the reproductive organs, the race of the parent animals is determinative. There is very little likelihood of being able to modify this inherited sexual ratio by means of outward influences affecting the ova and the ripe semen prior to fertilization, and just as little by means of a number of abnormal influences (change of climate, of water, of nutriment, etc.) acting on the fertilized ova.

Düsing,—who in his work on "The Regulation of the Sexual Ratio" (Jena, 1884) most ingeniously advocates the thesis that all animals have the power, when there is a lack of individuals of one sex, of procreating an excess of individuals of this deficient sex, or, to put it in another way, that an excess of one sex determines the procreation of an excess of the other sex,—instituted experimental investigations regarding the determination of sex in the following manner (in accordance with a suggestion made by *Pflüger*): About ninety guinea-pigs were distributed in two pens in such a way that in one pen there was a great deficiency of males and a great excess of females, whilst in the other there was a deficiency of females and an excess of males. Thus the sexual ratios in the two stalls were opposed. In accordance with *Düsing's* theory, therefore, more males should have been born in the first pen and more females in the second pen. Every week each pen was examined once or twice, the sex of the new-born young was ascertained, and they

were distinguished by small incisions in the margin of the ear. A week later, when the young animals had developed a little further, they were re-examined to make sure that no mistake had been made.

At first, in the pen containing the original excess of females, there occurred a quite remarkable excess of male births. This, however, was merely the result of chance, for soon the relationships of the sexes among the new born was reversed, and thenceforward many more females were born than males. But if all the births occurring in this experiment are taken into consideration the number is still far too small to allow trustworthy conclusions to be drawn.

Düsing emphasizes the fact that such an experiment as this, in order to furnish results worth consideration, must be continued until the sexual ratio has become constant, so that it is no longer subject to alteration by chance variations. If we assume that *Düsing's* theory is false, the results obtained would be the following: In both the pens, in that in which there was originally an excess of females and in that in which there was originally an excess of males, the births, if observed through a sufficient period, would present a definite sexual ratio which would be the same in both the pens. But if the theory is well founded the sexual ratio of the new born would vary in the two pens: in the stall in which there had originally been a deficiency of males there would be an excess of births of males over females; whereas in the pen in which there had originally been a deficiency of females there would on the contrary be an excess of births of females over males. *Düsing* recommends that for such experiments even more fruitful animals, such as rats and mice, should be utilized.

Institutes for pisciculture would also be extremely suitable for such experiments in breeding for the determination of the matter under discussion because, owing to the fact that in these animals fertilization is effected outside of the body of the parents, a direct examination of the ova and the semen used in the experiments can be undertaken, and the fertilization can be made to occur under conditions subjected to various alterations; also we can employ the roe and the sperm of fishes whose age, life history, weight and size are accurately known.

Much attention has recently been paid to the theory of *Schenk*, based, as he states, upon numerous experiments regarding the influences by which sex is determined. This observer also starts from the principle that ovulation is not independent of the influences of

nutrition and metabolism. He believes that in the cases in which combustion in the body is effected in such a manner that remnants of unconsumed substances, still capable of heat-production, make their appearance in the urine, the ovum of the human female in process of formation is not so far advanced in its development as it is in cases in which the urine is entirely free from sugar, or at any rate is free from any demonstrable traces of the presence of this body. In the former case we shall find that the ovum is not only less mature, but also that it is presumably less well nourished. In his view such an ovum is less completely endowed in respect of the indwelling qualities and forces of its protoplasm, and it appears for this reason to be adapted only for the development of a female individual. But when, on the contrary, in the maternal individual, all the substances formed in and assimilated by the organism have undergone combustion so completely that there is no sugar in the urine, not even in the minutest discernible traces, the maternal body is in a condition suitable for the development of an ovum adapted to become a male individual. From these inferences, weak though the chain of argument is, *Schenk* draws the conclusion, that by the regulation of the nutritive material supplied to the organism, and by the suitable choice of that material, we are to a considerable extent enabled to support an ovum in its process of maturation in such a manner as to cause it to develop into a male individual.

The nutritive material selected for this purpose must be of such a nature that the elimination in the urine of even the minutest quantities of sugar may be prevented; the urine must appear free from sugar even when the phenyl-hydrazine test is employed. Thus in every case in which we wish to influence a woman's nutrition in such a way as to lead to the procreation of a male individual we must above all ascertain whether, in the woman in question, the normal quantity of sugar is present in the urine. If after the most careful examination no trace of sugar can be found in the urine, and if reducing substances are present in this excretion in abundance, no change need be made in the diet, and all we have to do is to recommend that the requisite fertilization should be effected as soon as possible, since there is every probability that in this condition the embryo will prove to be of the male sex. But when, on the other hand the "normal" quantity of sugar is present in the urine, or when even traces only of that substance can be detected, it is necessary by changes in the diet to cause the disappearance from the urine of every trace of sugar, and at the same time to bring

about the appearance in that fluid of an abundance of reducing substances. *Schenk* claims by the experiments he has made along these lines to have obtained results which show that it is possible in this way to influence the determination of sex.

His method is to nourish the mother mainly on nitrogenous materials and fat, and to give in addition only so much carbohydrate as is necessary to prevent the absence of this from being seriously felt. This diet should be continued for a considerable period, at best for two or three months before the fertilization is effected. After conception also, the same diet should be continued. In such a manner we are able in certain cases to bring about the procreation of male offspring. On the other hand, the desire for the procreation of female offspring remains one which as yet we have no direct means of fulfilling.

These vague experiments and ill-grounded theories of *Schenk's* do not, as a matter of fact, constitute an important advance in the theory of the voluntary determination of the sex of the human offspring. What in reality are the decisive influences in the determination of sex, and how the final impulsion in one direction or the other is actually effected, remain altogether obscure. Prediction of the sex of the offspring, and the voluntary procreation of male or female infants, remain problems for the solution of which the most essential data are still lacking.

Ernest Hæckel writes regarding *Schenk's* theory: "This important 'discovery,' which at the time of its first announcement attracted throughout the world an attention rarely given to true scientific advances, has now dwindled to the incomplete demonstration that the nutritive condition of the mother exercises a certain influence upon the determination of the sex of the child. But we knew this much a long time ago. *Düsing* and others, partly by physiological experiments and partly by statistical demonstrations, had shown that changes in the quantity and the quality of the nutriment supplied to either parent is capable of influencing the procreation of boys or girls. But if what *Professor Schenk* maintains were really true peoples living chiefly upon meat (as, for instance, in the pampas of South America) should have an exceptionally large proportion of male offspring; whereas those living mainly on a proteid-free diet (on meal, sugar, and other carbohydrates), should have an exceptionally large proportion of female offspring (as, for example, the rice-eating Indian and Mongolian nations). But this is by no means the case. And many other well-known facts are

likewise opposed to the 'epoch-making' theory of *Schenk*. Whether the fertilized ovum develops into a boy or a girl, depends, I am convinced, upon far more complex, and to a large extent still entirely unknown, physiological causes. The final judgment upon the 'Schenk theory' must be, 'Much Ado About Nothing.'"

Our exposition of the present standpoint of the doctrine of the origination of sex in the human species, has, in fact, shown that hitherto by statistical work, nor by anatomical investigations, nor, finally, by the experimental method, have results been obtained which render it possible to predict the sex of the unborn infant. And even in respect of the study of those influences which exercise a determining influence upon the origination of sex, no positive, indisputable conclusions have been reached. We can only say it appears probable that there exist *several* causes of the determination of sex the *co-operative* action of which proves effectual. Not in the ovum alone, nor in the spermatozoon alone, but in the reciprocal influence they exert one upon the other in the act of conception is sex determined. In the latter connection the relative and absolute ages of the progenitors appear to have a certain influence in the determination of the sex of the embryo; of importance also is the greater or less demand made upon the sexual capacity of the begetter; of influence too is the time at which the ovum is fertilized after its discharge from the ovary. It appears to be fairly well established that when the husband is at least ten years older than the wife, while the latter is at the age at which a woman's reproductive powers are at a maximum, more boys are conceived than girls (*Kisch*); also that one of the progenitors upon whose sexual capacities the greater demands are made, tends to procreate an excess of individuals of his or her own sex (*Fiquet, Düsing*); and, finally, that intercourse a considerable time after the cessation of the menstrual flow (in the second week of the intermenstrual interval or later) is favourable to the procreation of a male infant (*Thury, Hensen*). The influence of nutritive conditions in the determination of sex is less clearly established.

Statistical evidence has proved beyond dispute that given a sufficiently large number of instances in varying conditions the sexual ratio is 106, and this fact suggests that the determination of sex is dependent upon the interaction of two influences operating in opposite directions within narrow limits, in such a manner that the chances of the birth of a male infant preponderate over the chances of the birth of a female infant in the proportion of 106 to 100. In

elucidation of this fact *Hensen* makes the following comparison: "Let us imagine a balance the beam of which has two arms of equal length; from the two extremities of this beam two balls of nearly equal weight begin to roll toward one another; if one ball rolls more quickly than the other, if one is lighter than the other, or if one starts to roll before the other, the opposite end of the beam will sink. The three influences are variously distributed; one influence may reinforce another, or may counteract another; but a decisive sinking of one end of the beam will always ultimately ensue. A minimal shortening or lightening of one arm of the balance will make the chance that the other arm will descend correspondingly greater."

STERILITY IN WOMEN.

When we study the history of human civilization we find that sterility in women is regarded, not merely as a misfortune, but as a reproach. Among savage races, and in the Orient, where the position of women is one of strict subordination, she does not attain an honourable status until she becomes a mother. In Persia, a sterile woman is always divorced by her husband. In India, also, when a sterile married woman has in vain employed the various religious measures advocated for the relief of her barren condition she is sent back to her parents. Both in China and Japan, a barren woman is regarded as a most miserable creature. Among the negro races, a woman who fails to bear children is the object of scorn and contempt. Among the Dualla negroes, a man whose wife fails to bear children demands from her parents the return of the sum which he paid for her at the time of marriage. Many of the indigenous tribes of South America also make a practice of divorcing a sterile wife. Among the better-class Circassians, the women do not attain an assured position until they have borne a child. In Angola a barren woman is the object of universal contempt, and she often feels the ignominy of her position so keenly that she commits suicide. Alike among the Jews and among the Turks, barrenness in a wife is a recognized ground for divorce, and the woman who has been divorced for this reason will hardly ever succeed in obtaining another husband, for she is regarded as one whose body is not properly developed. According to old German law, barrenness in a wife and impotence in a husband were both grounds for divorce. The code of the Emperor Justinian allowed of divorce in cases in which for the space of two years a husband had been unable to fulfil his marital duties, and such a union was termed

innuptæ nuptæ. Among the ancient Romans, although they regarded barrenness as a mark of the divine disfavour, according to the laws of Augustus failure to bear children was a punishable offence, and such a punishment was incurred by any married woman who had attained the age of 20 years without having become a mother. In ancient Greece also, divorces due to the barrenness of the wife were by no means uncommon. Among the Slavonic peoples sterility was so greatly despised that there is a Slavonic proverb which runs: "A woman is no woman until she has borne a child": and in Istria a sterile woman is known by the nickname "Scirke," which is equivalent to "hermaphrodite." The Jewish view of the matter is expressed in the Talmudic rabbinical saying: "A wife's duties are beauty, gentleness, and the bearing of children"; and again, "the poor, the leprous, the blind, and the childless, are like the dead"; and, finally, "he who refrains from marriage with the deliberate intention of having no children, incurs the guilt of murder." In the Koran we find the fatalistic expression, "God makes a woman barren in accordance with his will."

We can therefore readily understand that in the most ancient medical writings the question of sterility in women is a matter of earnest consideration. In the works of the early physicians of Hindustan we find several apt remarks on the subject. *Susruta* says: "Pregnancy most readily results from intercourse during menstruation. At this time the os uteri is open, like the flower of the water lily in the sunshine." In the Old Testament, in which the newly-created human couples receive the command, "Be fruitful and multiply, and replenish the earth," we find frequent references to barrenness as a state equally dishonourable and unfortunate, and the use of certain plants is recommended as a means of cure. The Talmud contains several essays dealing with the causes and treatment of sterility.

The *Hippocratic* collection of writings contains a number of passages dealing with the causes of sterility and with the means to be employed for its relief. We shall have occasion later to refer to these recommendations. *Celsus*, on the other hand, has little to say on this subject. In the works of *Pliny*, and also in those of *Aristotle*, there are references to the topic of sterility.

Among the writers of the first century of our era, *Soranus* discusses exhaustively the capacity for conception and sterility. In his work we find, among other passages, the unquestionably accurate remark: "Since the majority of marriages are con-

cluded, not from love, but in order to procreate children, it is difficult to understand why, in the choice of a wife, less regard is paid to her probable fertility than to the worldly wealth of her parents."

In the middle ages, *Paulus Agineta* more especially treats of the diseases of women, and among these, of sterility in women. That in Arabian medicine much attention was paid to this question, we can learn from the writings of Maimonides.

By sterility in women we understand the pathological state in which a woman who is sexually mature fails to conceive, notwithstanding frequently repeated, normal sexual intercourse throughout a considerable period of time.

Sterility is termed *congenital* (or *absolute*) when, notwithstanding repeated intercourse throughout a long period (not less than three years), pregnancy has always failed to ensue; it is termed *acquired* (or *relative*), when women who have already been pregnant once or more often, cease to conceive, although they are still quite young enough to do so, and have experienced regular sexual intercourse for a long period (not less than three years). In a wider sense of the term, we say that a woman is sterile, when, notwithstanding prolonged and repeated sexual intercourse, in circumstances favourable to procreation, she has failed to give birth to a living and viable infant.

English authors also make a special distinction regarding that form of acquired sterility (which is no great rarity), in which a woman gives birth to a single infant and subsequently remains sterile ("*only-child sterility*").

The civilization of the present day, with its shady side, has made it necessary for us to pay an increasing attention to *facultative sterility*, dependent upon the use during intercourse of means for the prevention of conception; and very recently the surgical tendency of modern gynecology has brought into being a new variety of sterility in women, viz., operative sterility.

The period which must elapse after marriage, before the absence of pregnancy must lead us to regard a woman as sterile, is fixed at three years. This limitation is based upon the statistical data which (see Table on page 368) I gave regarding 556 fruitful marriages.

The ideal state of fertility, that in which conception is the immediate result of the first act of intercourse between husband and wife, the conception being followed in due course by the birth of a child,

is, like most other ideals, one very rarely attained. In the human species, conception as the immediate result of the first act of sexual intercourse, is an extremely unusual occurrence. To invoke medical assistance for women who have failed to conceive during the first three months of married life, which my experience shows to be more frequently done now than formerly, is devoid of all justification; and still worse is it, in this period of "early love" to subject women, as has often been done recently by overenergetic gynecologists, to local treatment, even to the extent of operative procedures.

We are not justified in speaking of the existence of actual sterility until three years of marital intercourse have failed to result in conception; still, when the commencement of the first pregnancy is delayed for more than sixteen months after marriage, there is considerable probability that the woman is sterile; and this probability increases month by month till the expiry of the second year, whilst as the end of the third year approaches, it becomes tantamount to certainty.

Sterility is one of the commonest of the functional disorders of women, and one of those which most often demand gynecological assistance.

By a statistical study of the marriages of the royal and princely families of Europe and of the marriages of the highest families of the aristocracy, I learned that of 626 marriages, 70 were barren; thus the ratio of fruitless to fruitful marriages proved to be as 1:8.87. But in other circles of society, in so far as data relating to the matter were obtainable in my practice, the statistics of infertility were by no means so unfavourable, the ratio working out at about 1 barren to 10 fruitful unions. I must point out, however, that these statistics, like all statistics of fertility, are to a degree invalidated by the fact that in a certain number of the instances included among the barren, an unnoticed abortion may have occurred.

Simpson, in his investigation regarding the frequency of sterile unions, found a ratio of 1:8.5 (in 1252 instances). In the English aristocracy, where the marriages are for the most part restricted among the members of a comparatively small number of families, the ratio was 1:6.11 (495 instances); on the other hand, among the population of Grangemouth and Bathgate, consisting chiefly of persons engaged in seafaring and agricultural occupations, the ratio of barren to fruitful unions was as 1:10.5.

Spencer Wells and *Marion Sims*, as a result of their investigations, give a ratio of 1:8.

According to *Seeligmann*, in Hamburg, among marriages of persons in all classes of society, 11.5% are barren. *Prochownick* found among 2500 women, all of whom had been married for eighteen months or more, and none of whom were more than 40 years of age, that 9% had failed to conceive.

According to *Frank* and *Burdach*, who do not publish the figures upon which their estimate is based, only 1 marriage in 50 proves barren. *Lever*, who also gives merely his percentage result, states that 5% of married women are completely infertile. *Hedin*, dealing with a Swedish community of 800 persons, states that the percentage of sterile unions is barely 10.

According to *Gochlert's* statistical investigations, in the dynasty of the Capets, among 450 marriages, 19.7% were sterile: in the Wittelsbach dynasty (Bavaria), among 177 marriages, 23.7% were sterile; and among the ruling families of Germany (more than 600 marriages), 20.5% were sterile. In this investigation, however, no attention is paid to the age of husband or wife; marriages and remarriages are classed together without discrimination; and those marriages only in which a living child was born are counted as fruitful, so that the unions counted as sterile must contain many in which abortion or stillbirth occurred. In three Esthonian communities in Livonia, *Ochren* found that among 2799 marriages, 8.4% were barren, but in this instance also stillbirths were ignored.

Ansell reports that of 1919 marriages of women belonging to the upper classes, their mean age being 25 years, 152 proved barren, a proportion of 1:12, or about 8%.

Matthews Duncan communicates the following data. In the year 1855, in the cities of Edinburgh and Glasgow, 4447 marriages were contracted, and of these 725 proved barren, a proportion of 1:6.1; 75 of these may however be excluded from consideration, inasmuch as the wives were already at the age of 45 or upwards. Among the remaining 4372 marriages, 662 proved barren, a proportion of 1:6.6. In other words, 15% of all marriages of women between the ages of 15 and 44 proved sterile.

From France we obtain figures showing a much higher proportion of sterile unions. According to *Rochard*, in France in the year 1888, of ten millions families, two million had no child at all, and two million had each an only child, so that two fifths of the families of France were taking no practical part in the maintenance of the

population. According to *Chevin*, the proportion in France of barren to fruitful marriages is as 1 : 5. 20% are entirely barren, while 24% exhibit only-child-sterility.

From Massachusetts, *Morton* reports that according to the last census returns, one fifth of all married women are childless.

In England, numerous trustworthy statistics can be obtained regarding the frequency of sterile marriages. The average proportion of barren to fruitful unions was:

Among the patients in St. Bartholomew's Hospital.	1 8
Among the inhabitants of Grangemouth	1 10
Among the inhabitants of Bathgate	1 10
Among the British peerage	1 6
Among the upper classes	1 12
Among the inhabitants of Edinburgh and Glasgow.....	1 7

Matthews Duncan compiled the following table relating to 504 absolutely sterile women met with in his practice:

AGE AT MARRIAGE.	NUMBER OF YEARS MARRIED.							Totals.
	Less than 3.	4 to 8.	9 to 13.	14 to 18.	19 to 23.	24 to 28.	29.	
15 to 19....	12	19	15	4	7	2	1	60
20 to 24....	70	66	37	24	13	9	.....	219
25 to 29....	47	51	20	8	8	.....	.....	134
30 to 34....	26	20	8	.....	1	.....	.....	51
35 to 39....	6	13	4	.....	.....	.....	.....	23
40 to 45....	6	3	.....	.....	.....	.....	.....	9
Totals....	167	172	84	40	29	11	1	504

Ansell bases upon the observations made by him in the case of 152 sterile women the conclusion that there is no longer any chance of the occurrence of pregnancy if a woman is:

More than 48 years old, and has had no child for	2 years
More than 47 years old, and has had no child for	3 years
More than 46 years old, and has had no child for	4 years
More than 45 years old, and has had no child for	6 years
More than 44 years old, and has had no child for	8 years
Less than 44 years old, and has had no child for	10 years

If we take into account also cases of acquired sterility, the proportion of barren to fruitful marriages becomes even more unfavourable, and the proportion increases enormously if, with *Grüne-waldt*, we number among the barren women those who fail to continue childbearing up to the normal climacteric period. *Grüne-waldt*, dealing with about 1500 women suffering from affections of the reproductive organs, excluded all those who were either virgins

or widows, and also all those who at the time of the observed barrenness were over 35 years of age; this left more than 900 women suffering from affections of the reproductive organs, all of whom were sexually mature, and were living in marital intercourse; of these, nearly 500 were barren, 300 being instances of acquired sterility, and 190 instances of congenital sterility. Thus, according to this observer, disease of the reproductive organs in women led in more than 50% of the cases to disturbance of the reproductive capacity; about one in every three women, previously competent to bear children, became barren when affected with disease of the reproductive organs; and among every five gynecological patients of the condition already specified as regards age and sexual intercourse, one proves congenitally sterile.

It must not, however, be forgotten, that sooner or later after marriage artificial sterility tends to come into being, its early or late appearance depending upon the degree of civilization and upon the national and economical conditions of the people and the individuals concerned. This fact must not be left out of the account.

The manner in which, in the human species, fertilization is effected, is still far from clear in all its details; hence it is easy to understand, that the etiology of sterility remains in many respects obscure. It is impossible in every case to find a definite cause. Whereas, on the one hand, notwithstanding the existence of apparently insuperable obstacles, impregnation may nevertheless be effected; so, on the other hand, sterility may exist in cases in which all the circumstances appear favourable to the occurrence of conception. Hence a classification of the different varieties of sterility from the etiological standpoint, is a very difficult task, and the conclusions thus obtained are often vitiated.

Although it cannot be denied that mechanical causes are competent to lead to sterility in women, *Sims*, in his advocacy of the mechanical doctrine of sterility, widely overshoots the mark. His authority, however, has led to a general acceptance of this doctrine, which is by no means justified by facts. The theory of mechanical obstruction, according to which sterility in women depends upon mechanical obstacles to the passage of the spermatozoa towards the ovaries, is from time to time strikingly illustrated by cases coming under our notice—cases the nature of which can hardly be overlooked; but it is quite wrong to suppose that this causation accounts for the *majority* of instances of sterility in women, and

strict limitations should be placed upon the employment of surgical measures based upon this mechanical theory of sterility.

The mechanical view has been counterposed by *Von Grünwaldt* with a doctrine in which especial stress is laid upon obstacles to utero-gestation, sterility being regarded as a functional disorder brought about by affections of the female reproductive organs rendering the uterus unfit for the incubation of the ovum. It cannot be denied that the elucidation of this casual influence was a valuable contribution to the theory of sterility, and it is unquestionable that many morbid conditions of the uterus exist capable of giving rise to sterility in this manner; but we must avoid the error of regarding this doctrine as a full explanation of the cause of sterility.

If, however, both of these theories of sterility are insufficient, we cannot regard a third theory, that of *Matthews Duncan*, as filling the gaps in our knowledge. It would be most unfortunate if this author were right in maintaining that all our knowledge of the causes of sterility is to be summed up in the phrase "deficient reproductive energy;" we cannot agree with *Duncan* in his belief that "Sterility is an imperfection devoid of all perceptible, measurable characteristics;" nor can we follow him when he maintains that local causes, whether they are such as hinder conception, or such as hinder utero-gestation, have a very limited sphere of activity. *Matthews Duncan* adopts an incomprehensible standpoint when he regards sterility as dependent upon a law of nature, as a condition which may affect distinct classes or an entire population.

According to the latest doctrine of sterility, only in quite exceptional instances is the woman regarded as responsible for the occurrence of sterility; contrariwise, the male genital organs are commonly blamed for the affection, which is in the overwhelming majority of cases supposed to be due to azoospermia, usually dependent upon gonorrhœal infection; compare with this, affections of the female reproductive organs are said to play a quite subordinate role in the etiology of sterility. But for my part, though I recognize the important share that gonorrhœa in the male plays in the causation of sterility, I am of opinion that the extreme view just mentioned is by no means justified by the facts.

Sterility, a functional disturbance of an extremely complicated nature, can, in my opinion, be most usefully elucidated from the etiological standpoint by starting with the assumption that three conditions are absolutely essential to procreation:

1. that ovulation proceeds in a perfectly normal manner, the maturation of the discharged ova being complete;
2. that normal spermatozoa have access to these normal ova (conjugation of male and female pronuclei);
3. that the uterus is properly adapted for the gestation of the fertilized ovum.

My classification of the varieties of sterility corresponds to these conditions of procreation:

1. sterility due to incapacity for ovulation;
2. sterility due to some hindrance to the conjugation of ovum and spermatozoon (under this head come also those cases in which the male is at fault — azoospermia, and the like);
3. sterility due to incapacity for gestation.

It must also be admitted that there are additional causes of sterility, causes which lie beyond our control. Moreover, as I have already mentioned, in most cases of sterility, we have to do, not with a single cause, but with the resultant of two or more cooperating causes.

Incapacity for Ovulation.

Incapacity for ovulation, the first and most decisive cause of sterility in women, may be absolute and irremediable, or relative and transient. We have to do with the former in cases in which the ovaries are entirely wanting, or when they are affected with organic disease to such a degree that they have become incapable of fulfilling their function of ovulation; incapacity for ovulation is, on the other hand, relative and transient in certain pathological states of the ovary and neighbouring organs, when there is incomplete development or partial atrophy of the ovaries, when there are new-growths of the ovaries, in cases of oophoritis and perioophoritis, in consequence of disturbances of innervation, diseases of the central and peripheral nervous system, violent emotional disturbance, constitutional disorders, such as syphilis, chlorosis, anaemia, universal lipomatosis, scrofula, alcoholism, and morphinism, also in consequence of changes in the supply of nutriment and in the general mode of living, or of senile changes, and finally in consequence of hereditary influences.

The diagnosis of the etiological influence of suppressed or incomplete ovulation in the production of sterility in women is at times beset with great and even insuperable difficulties. The state of the menstrual function, suppression of the flow, or the regularity or irregularity of its occurrence, serve indeed to inform us as to

the general activity or inactivity of the function of ovulation; but the variations in this function give no certain information as to whether a woman is fertile or infertile. Knowing as we do that generally speaking an intimate connexion subsists between menstruation and ovulation, we are indeed able to assert that regular menstruation and fertility in women run a parallel course, and further, that the greater the irregularity of the menstrual function, the greater the tendency to sterility. Recently, great advances have been made in the technique of manual exploration of the ovaries, and by means of vaginal and rectal bimanual examination, we are now able to obtain accurate information regarding abnormalities in the size, shape, and position of these organs, and regarding any other intra-pelvic disorders. In this way we have been enabled to recognize a number of pathological states of the ovaries which affect the functions of these organs. In some cases also there are general symptoms which furnish us with the means of drawing conclusions, more or less trustworthy, regarding the state of the ovarian functions; for instance, the general development of a woman's body, the condition of the external genitals, the vulva, the mons veneris, the pubic hair, the clitoris, and the mammae. Again, we can derive information from various troubles of which women complain; such as sacache; a sense of weight and pressure in the pelvis; feelings of tension and shooting pains in the breasts; flushings of the face; haemorrhage from the nose, mouth, or rectum, recurring at regular intervals and vicarious in nature. In many instances, however, it will only be by obtaining data regarding the age, mode of life, and family history, of the person affected, that it will be possible to draw conclusions as to the cause of the sterility.

The female reproductive glands, the ovaries, may, owing to developmental disturbances during foetal life, either be entirely wanting, or they may merely be deprived of certain structural constituents, especially their epithelial elements. In the former case, we have congenital complete unilateral or bilateral absence of the ovary, a condition most commonly associated with the absence or with a rudimentary condition of other portions of the reproductive apparatus; in the latter case, we have the condition somewhat inappropriately named congenital atrophy of the ovary.

Complete absence of both ovaries necessarily leads to absolute sterility. Both congenital absence and congenital atrophy of the ovaries, will usually be found in association with other anomalies of the sexual organs. Absence of one ovary, on the other hand, by no means entails sterility; on the contrary, when a single well-formed ovary exists, ovulation usually proceeds in a perfectly

normal manner. When such women marry, pregnancy usually follows in the normal proportion of cases; and, in complete opposition to one of the theories of the determination of sex to which allusion has been made, such women bear children of both sexes.

Morgagni described a case of congenital absence of both ovaries in a woman 66 years of age, in whom the external genital organs, the vagina, and the uterus, were imperfectly developed, but the Fallopian tubes were of normal size. Careful examination of the upper borders of the broad ligaments of the uterus disclosed no trace of ovary on either side.

Quain, in a virgin 33 years of age, found the vagina rudimentary, with its mucous membrane but slightly corrugated; at the upper end of this passage was a semilunar fold which probably represented the uterus. The ovaries were absent; a small gland-like body embedded in the left wall of the vagina was regarded by him as a rudimentary ovary. The configuration of the body was feminine, feminine also the disposition; moreover, there was a monthly recurrent epistaxis.

The atrophy of the ovaries which normally takes place at the climateric period, to be more minutely described in the section on the menopause, has constitutional effects similar to those dependent upon absence or congenital atrophy of the ovaries.

A rudimentary condition of both ovaries, or bilateral atrophy of these organs, with or without associated atrophy of the entire reproductive system, commonly entails sterility. In such cases, in addition to amenorrhoea, we usually find that the breasts are but slightly developed, the pubic hair is scanty, the labia majora and labia minora are small, whilst sexual appetite is deficient, and during coitus the woman is entirely passive. On the other hand, we must not make the mistake of inferring from the fact that the sexual appetite is keen and coitus pleasurable, that therefore the capacity for ovulation is normal. Even after operative removal of both ovaries, some women have assured me, not only that the sexual impulse was as strong as formerly, but even that they continued to experience the sexual orgasm in its full intensity. This is analogous to the well known fact that men who have undergone castration after arriving at sexual maturity may remain capable of performing coitus. It is a matter of history that in the lupinars of ancient Rome, castrated men were kept to enable women to enjoy the pleasures of sexual intercourse without fear of consequences; and it is said that such men are to be found in Italian brothels to this day. In the case of the lower mammals, it appears to be the rule that when the reproductive glands are removed in early youth, every trace of sexual desire disappears.

Incomplete development of the ovaries, with consequent defective ovulation, may result from marriage in girls who are still

immature — a fact already known to *Aristotle*, who wrote, “premature marriage leads to a scanty progeny — that this is the case in man as well as the lower animals is witnessed by the weakly inhabitants of regions in which child-marriage is common.”

It is shown by statistical data that the age at which puberty occurs, the age, that is, at which the menstrual flow begins, has a relation to sterility; and the same is true as regards the age at marriage. In the former connexion, women in whom puberty is comparatively early, are less often sterile than those in whom puberty is comparatively late. *Emmet*, in an investigation embracing 2330 cases, showed that in our climate the average age at which the first menstruation occurred was 14.23 years, and that in the case of women who subsequently proved fertile, the first flow took place on an average 26 days earlier than in the case of women who subsequently proved barren. We also learn from *Emmet's* tables that the mean duration of menstruation and the mean quantity of the flow are larger in fertile than in barren women.

As regards the influence of the age at marriage upon fertility, in women who marry between the ages of 20 and 24 years, sterility is most infrequent; it is commoner in women who marry between the ages of 14 and 20; after the age of 25, the proportion of sterile women increases with each year to which marriage is postponed.

Premature atrophy of the ovaries, with consequent incapacity for ovulation, may occur in a great variety of conditions; it has been observed in scrofula, diabetes, rickets, phthisis, and malarial cachexia; it also occurs in certain chronic intoxications, as from the long-continued use of opium or morphine, and from the abuse of alcoholic beverages. According to the observation of *Burkart*, *Levinstein*, and *Erlenmeyer*, morphinism is a condition which may be relied upon to bring about amenorrhoea and temporary sterility from cessation of ovulation. It has been asserted but by no means proved, that the long-continued administration of quinine hinders ovulation. As a result of various acute and chronic disorders, a simple atrophy of the ovarian follicles can be detected, dependent upon simple fatty degeneration; this has been seen by *Grohe* in children as a result of general atrophy, and also following caseous and suppurative diseases of the respiratory organs; by *Slavjansky* in children after chronic pneumonia and chronic dysentery, and in adults as a sequel of typhoid, and in one instance as a sequel of puerperal septicaemia.

Hyperplasia of the ovarian stroma, in slighter degrees of the affection, leads to menstrual disturbances, partly of nervous and partly of inflammatory nature, and in more severe degrees leads to sterility dependent upon the hindrances which the thickened tunica albuginea offers to the bursting of the mature follicles. *Klebs* be-

lieves that this anomaly is always due to a disposition acquired very early in life, and perhaps at the time when the ovaries are first developed.

Follicular cysts of the ovary, which are formed mostly at the time of puberty, and originate under the influence of menstrual congestion, from graafian follicles near to ripeness, are competent to cause sterility, owing to the pressure they exercise upon the superficially placed rudimentary follicles, leading to the atrophy of these latter. Other new-growths of the ovaries have similar effects, such as adenomata, carcinomata, dermoid cysts, cystomata, sarcomata, and fibromata. In many cases of these disorders, however, the ovarian follicles may for long periods remain unaffected; and in these instances, ovulation, menstruation, and even conception, may proceed undisturbed. Even in cases in which a neoplasm attains a great size, if it affects one ovary only, ovulation may occur normally in the other, and conception may ensue; and even in the diseased ovary, if small portions of its tissue remain unaffected, ovules may be discharged from these portions. The minutest portion of healthy ovarian tissue, though all the remainder has been destroyed by disease, may suffice to bring about conception.

Ovarian tumours appear with considerable frequency to be complicated with sterility; but in such cases the question always remains open, whether in the majority of instances the sterility is to be regarded as the cause or as the consequence of the ovarian disease. *Boinet's* figures dealing with this problem are the most striking of all. He states that of 500 women with ovarian tumours, 390 were childless. But these results are challenged by other observers. *Veit's* estimates, based upon a compilation of the figures of *Lee*, *Scanzoni*, and *West*, is that 34% of women with ovarian tumour are sterile. On the other hand, *Negroni's* collection of 400 cases of ovarian tumour, including both married and unmarried, contained 43 only who had never been pregnant. Other lists show: 13 sterile women among 45 suffering from ovarian tumour (*von Scanzoni*); 1 sterile among 21 (*Nussbaum*); 8 sterile among 63 (*Olshausen*). *Winckel*, among 150 sterile married women, found 32 suffering from ovarian tumour, which in two of these cases only was bilateral. *Atlee*, in 15 cases of ovarian tumour, observed premature cessation of menstruation at the ages of 30, 39, 40 and 42, respectively.

Although in many cases sterility develops coincidently with the growth of an ovarian cystoma, yet in many other women such tumours have no influence in diminishing fertility. *Martin* in a case in which sterility existed in connexion with a unilateral ovarian cystoma, the other ovary being healthy, observed pregnancy as a sequel of the removal of the diseased ovary. In one of these cases,

after removal of the ovarian cystoma, *Martin* punctured in the other ovary a dropsical follicle which had attained nearly the size of a walnut. Pregnancy in this case also followed the resumption of marital intercourse. *Müller* reports that in his clinique within recent years pregnancy complicated with ovarian tumour has been observed in 7 instances; in one of these cases the pregnancy occurred notwithstanding the fact that the new-growth was so large as almost to fill the abdominal cavity. *Holst* reports the case of a multipara 43 years of age who died in the 18th to the 20th week of pregnancy; at the post mortem examination the left ovary was found to be transformed into three cysts each the size of an apple, whilst in place of the right ovary was a medullary carcinoma the size of a man's head; on neither side could a trace of normal ovarian tissue be detected. *Spiegelberg*, in a woman who died shortly after giving birth to her second child, found that both ovaries were transformed into myxo-sarcomatous tumours; in a woman aged 42, who died four weeks after her eleventh confinement, both ovaries were found to be transformed into nodular carcinomatous tumours each larger than a child's head; in none of these ovaries was any normal stroma to be found. *Ruge* reports the case of a woman 36 years of age, who miscarried in the sixth month of pregnancy; she had myxo-sarcoma of both ovaries, one weighing 5620 grammes the other 480 grammes.

All these cases indicate that, notwithstanding the existence of extensive degeneration of both ovaries, some minute remaining fragment of healthy ovarian stroma is competent to produce normal mature ova—a fact which has often been proved also by microscopical examination. That under the influence of pregnancy, existing ovarian tumours often take on extremely rapid growth, is also indicated by some of the above cases.

Castration (oöphorectomy, spaying, *Battcy's* operation), the removal of both ovaries, naturally results in sterility. If in the literature of the subject cases are to be found in which, after this operation, not menstruation merely, but even pregnancy has occurred, this is to be explained either by the fact that in the stump there was left a fragment of the ovary, still containing tissue capable of producing mature ova; or else by the existence of a supernumerary ovary. *Schatz* reports the case of a woman in whom pregnancy occurred after double oöphorectomy. In the month of February, 1880, this operation was performed on a girl twenty years of age; she married in April, 1884; and in May, 1885, she was delivered of a mature female infant. The history of the case and the details of the operation showed clearly that the left ovary had been completely removed, with the outermost third of the left Fallopian tube; the right ovary was cut away in such a

manner that a strip of tissue of at most two millimetres (one twelfth of an inch) in width was left in the body, whilst the right Fallopian tube was left intact. This case teaches us that the smallest remnant of the ovary is competent to render normal pregnancy possible; and further, that a small size of the ovary no more constitutes a hindrance to the proper reception of the ovum in the Fallopian tube, than does an abnormally large size of the ovary, or an unusual shape of this organ.

Miklucho-Mackay relates that among the indigens of Australia the removal of the ovaries is often practised, in order to create a special kind of hetairae incapable of becoming mothers. *McGillivray* saw at Cape York a native gin whose ovaries had been removed because she was a congenital deaf-mute, with the object of preventing her giving birth to deaf-mute infants. In the beginning of the last century there existed in Sayn-Wittgenstein a small religious sect whose custom it was always to conclude their religious services by indiscriminate carnal union among the members of the community; when women and girls were first admitted as members of this sect, an attempt was made to render them unfitted for conception "by means of a painful and dangerous compression of the ovaries." (*Ploss*.)

A transient, relative hindrance to ovulation may be brought about by various pathological states of the ovaries. Acute oophoritis usually suspends the ovarian functions; chronic oophoritis has sometimes a similar effect, not only because the profound changes that take place in the ovary hinder the formation of the ovules, but also because, as we shall later explain more fully, the expulsion of the ova and their reception by the Fallopian tubes are hindered. In severe oophoritis and perioophoritis, more especially in parenchymatous inflammation, sterility may be brought about by an absorption of the finely granular contents of the follicles, which collapse, with adhesion of their walls; when all or most of the follicles are thus affected, the ovaries become small and hard.

In perioophoritis, the exudation leads to the formation of cord-shaped or ribbon-shaped adhesions between the ovaries and the broad ligaments, the uterus, and the peritoneal folds of the neighbourhood. The ovary in such cases may also be displaced, or may undergo atrophy from pressure.

In the case of 200 sterile women, I found in 46 instances chronic oophoritis and perioophoritis. *Olshausen* reports that of 12 married women suffering from chronic oophoritis, five were barren, whilst of the remaining 7, three only had given birth to more than one child. *Matthews Duncan*, on the other hand, saw pregnancy in a case of bilateral ovarian inflammation, in which the organs were considerably enlarged.

Further, local or general peritonitis may lead to perenchymatous inflammation of the ovaries, and this, spreading from the periphery towards the centre of the organ, attacks the follicles irrespective of their ripeness. Again, during the puerperium, the interstitial form of oophoritis is by no means rare, and this may at times lead to permanent sterility in either of two ways: it may be in consequence of the onset of a secondary parenchymatous inflammation, which destroys all the follicles; it may be because a thick and tough layer of sclerosed tissue forms around the periphery of the ovary, which mechanically prevents the maturation and rupture of the follicles. According to *Slavjansky*, puerperal disease is the principal cause of this form of oophoritis. *Olshausen* indicates as the most frequent cause of primary perioophoritis, an inflammation propagated from the Fallopian tubes, leading to the formation of masses of exudation, which envelop the ovary, and by the pressure they cause, and by interfering with the blood-supply, lead to atrophy of the gland.

Sometimes the chronic inflammatory induration by means of which the stroma of the ovary is rendered denser and firmer, is due to changes in the vessels, and depends upon valvular defects of the heart—upon venous congestion. In this way, heart disease may hinder ovulation and bring about sterility. Both syphilis and gonorrhoea may give rise to chronic inflammatory changes in the ovary, usually leading to premature contraction of the tissues and to the formation of numerous adhesions. According to *Olshausen*, amenorrhoea is not a common feature of ovarian disease, except in cases of defective development of these organs, of cirrhosis of the ovaries, and of bilateral new-growths. Disease affecting only a single ovary, even tumour of considerable size, rarely causes amenorrhoea until profound constitutional disturbance has ensued. An exception to this rule is found in the case of carcinomatous tumours of the ovary; these, indeed, are commonly bilateral; but even when confined to a single ovary, amenorrhoea is a comparatively early symptom. According to the same author, sterility is a common consequence of chronic oophoritis and its sequelae, and is usual also in cases of bilateral new-growths; on the other hand, tumours affecting a single ovary often fail to prevent conception even though they have attained a great size.

Syphilis in women must be regarded as a frequent cause of sterility, by interference with ovulation, but is in this regard by no means an absolute bar to the occurrence of pregnancy. According to *Parent* and *Duchatellet*, under whose observation during the space of 12 years there came annually an average number of 2625 syphilitic prostitutes, the average annual of births in these cases was 63 only. According to *Marc d'Espine*, 2000 prostitutes gave birth on an average to two or three children in all during a year. (That there

are other causes besides syphilis for the remarkable infertility of women of the town, will be explained later). According to *Bednar*, *Mayr*, and others, constitutional syphilis in women invariably leads to sterility; others, as for instance *Zcissl*, believe that women suffering from inveterate syphilis are commonly, but not invariably, sterile; whilst according to *Rosen*, conception only takes place in syphilitic women in whom the disease has passed into the tertiary form. Experience shows, however, that neither early nor late forms of syphilis necessarily lead to sterility in women. It must also be pointed out, that syphilis in the male *may* be the cause of sterility, and *must* be the cause thereof when the disease is localised in the testicles, and the consequent degeneration of the glandular substance leads to the occurrence of azoospermia, more particularly when syphilitic or gummatous orchitis is bilateral. According to *Lewin*, we fail to find spermatozoa in 50% of men, otherwise powerful, suffering from syphilitic dyscrasia. *Hanc*, on the other hand, failed to find azoospermia in any one of ten men suffering from lues. In animals also syphilis is said to cause sterility.

The manner in which certain anomalies of the blood (anaemia and chlorosis), general disturbances of the nervous system, febrile states, and such constitutional disorders as scrofula, have a temporary or permanent influence in checking ovulation, is far from being understood; but the fact that ovulation is checked by such conditions, has been established beyond question by numerous observations. It is well known that severe fevers, more especially typhoid, suspend the ovarian function; that in various chronic disorders of an enfeebling nature, and notably in chlorosis, all signs of menstrual activity disappear; and that in certain nutritive disturbances, as in extreme obesity, amenorrhoea also occurs; finally, numerous cases are on record in which some sudden affection of the nervous system has instantaneously inhibited ovarian activity.

In anaemia and chlorosis, it is probable that the degree of menstrual congestion is insufficient to ensure the bursting of the graafian follicle. The sterility often observed as a sequel of typhoid, malaria, the acute exanthemata, cholera, and septicaemia, is probably due in most cases to the occurrence of parenchymatous oophoritis, with consequent destruction of the ovarian follicles. The researches of *Slavjansky* have shown that in acute disorders inflammatory changes often occur in the graafian follicles. When infectious disorders ran an acute course, this observer usually found that the parenchymatous inflammation of the ovary had occurred near the periphery, in the cortical layer, the destruction being limited almost exclusively to the primitive follicles; when the course of the primary disorder was more chronic, the mature or nearly mature graafian follicles were the ones destroyed. When inflammation of a follicle has led

to its destruction, it is replaced by a linear scar. *Lcbcdinsky* found similar changes in the ovary after scarlatina—destruction of a lesser or greater number of follicles, with formation of scars. Thus, parenchymatous oophoritis as a sequel of acute diseases, may, if severe, lead to destruction of all the rudimentary follicles, with consequent sterility. In the post mortem examination of such cases, the condition of the ovaries is similar to that which is elsewhere in this work described as characteristic of these organs after the menopause: the ovary is diminished in size, its surface is furrowed, the tissue is indurated in consequence of overgrowth of fibroid tissue; often not a single follicle is to be detected on section of the organ.

Immoderate obesity is a disorder of nutrition favoring the occurrence of sterility.

In very obese women of an age which normally is the reproductive prime, amenorrhoea or scanty menstruation is a very common accompaniment. In 215 such cases which came under my own observation, amenorrhoea was present in 49, and menstruation was scanty in 116; thus in nearly three fourths of these obese women menstruation was either deficient or entirely wanting. Very remarkable also is the high percentage of sterile women among the obese. In the 215 cases already mentioned (all married women). 48 were sterile—a percentage of 21. Whilst the ordinary ratio of barren to fruitful marriages is 1:10 or 1:9, in the cases in which the wives, or both wives and husbands, are extremely obese, the ratio is according to my own observations, 1:5—or, if we include cases of only-child-sterility, 1:4.

We cannot wonder at this great frequency of sterility in obese women when we remember that, apart from the menstrual deficiencies which so commonly accompany this disorder of nutrition, obesity is apt to entail many other disorders of the reproductive organs, as for instance a morbid state of the uterine and vaginal secretions, chronic metritis, and displacements of the uterus; still, it cannot be denied, that in many instances we are unable in such obese women to detect any disorder of the reproductive organs competent to account for the sterility, and we must therefore assume that the excessive development of fat has some direct influence in preventing ovulation, or at least that it in some way exercises an unfavourable influence upon the reproductive process.

That excessive obesity hinders fertility, is shown by experience both as regards the vegetable and the animal kingdom. All animal-breeders are familiar with the fact that undue production of fat limits fertility. Thus, equally in the case of turkeys and in the case of the common fowl, if the hens are overfed and become fat, they cease to lay.

Hippocrates already indicated obesity as a cause of sterility. Writing of the wives of the Scythians, he pointed out as a proof that their excessive obesity was the cause of the sterility from which they commonly suffered, the fact that their female slaves, who were thin, were readily impregnated by intercourse with the Scythian males. The oft repeated dwindling and disappearance of ruling families in India and in Egypt, has doubtless in part depended upon the extreme obesity of the female consorts of such rulers.

In many instances, indeed, a great accumulation of fat on the front of the abdomen and in the vulva, suffices to cause a simply mechanical hindrance to the proper performance of a fertilizing coitus. It is possible also that the phlegmatic temperament of very fat women is a contributory cause to their sterility—if indeed it is in general true that frigidity during sexual intercourse is unfavourable to conception, as is expressed by the old proverb, *quo salacior mulier, eo foecundior*. It is unquestionable that in very obese women sexual sensibility is commonly greatly deficient, and that their husbands often complain of their coldness and lack of passion. In several cases that have come under my observation, dyspareunia occurred in obese and sterile women.

The dependence of sterility upon obesity is often proved in the most striking manner *ex juvantibus*. A "cure" for the reduction of fat often results favourably in respect also of rendering the woman who undergoes it readily impregnable—a result by no means ardently desired.

It must also be pointed out that very obese women form a considerable section of those suffering from only-child sterility, and this largely in consequence of their strong predisposition towards abortion. As the impregnated uterus enlarges, the space for its accommodation is insufficient, owing to the great development of the panniculus adiposus, and thus obesity, like intraabdominal tumour, predisposes to abortion. The excessive accumulation of fat within the abdomen, by exercising pressure upon the inferior vena cava or on its principal tributaries, hinders the venous return, and gives rise to a chronic stasis in the uterine bloodvessels, those alike of the muscle and of the mucous membrane.

Notwithstanding the fact that sterility is so common in very obese women, the fact remains that some such women are remarkably fertile, and have very large families indeed.

Towers-Smith, Duke, and Rodriguez, who have recently all been engaged in examining the relations between obesity and sterility, agree in asserting that sterility due to obesity may be cured by dietetic treatment for the relief of the primary disorder of metabolism.

Though menstruation is usually deficient or absent in obese sterile

women, and though it is commonly supposed that amenorrhoea implies sterility, it is necessary to point out that whilst failure of menstruation is a frequent and important sign of suppression of ovulation, it by no means invariably has this significance. It is an established fact, and one borne out by my personal experience, that women who have never menstruated have nevertheless become pregnant; others, again, have become pregnant although they have ceased to menstruate for several years, and this has even occurred in women at a comparatively advanced age. Hence, from the fact that amenorrhoea exists, we cannot with certainty infer that a woman is sterile. Moreover, we must remember that physiologically amenorrhoeic women often enough conceive—during lactation. Although we hold the opinion that there is an intimate connexion between ovulation and menstruation, yet it is always possible in cases in which menstruation fails to occur, that ovulation has taken place, but that the stimulus which that process has exercised upon the reproductive organs has been insufficient to give rise to the customary flow of blood.

The following remarkable case came under my own observation: Mrs. B., 26 years of age, had lived in sterile wedlock for six years, has never menstruated, nor had she ever had any sanguineous discharge from the genitals. The body was delicately formed, the breasts were fairly well developed, the external genital organs showed no abnormality. For some weeks before consulting me, this woman, hitherto childless, and living in regular sexual intercourse with her husband, had noticed a remarkable enlargement of the abdomen. Another medical man whom she had consulted had diagnosed ovarian tumor and had urged operation. A more careful examination of the pelvis showed, however, that the woman was in the sixth month of pregnancy, a diagnosis which was duly confirmed by the delivery of a full-time child. In another of my cases, a woman married at the age of 45 years, having ceased to menstruate two years previously. She became pregnant and gave birth to a child in quite normal fashion. The following instructive case also came under my own observation: The wife of one of my colleagues, living in sterile wedlock for 17 years, extremely obese, had since puberty, menstruated but scantily and with great irregularity. The menstrual interval was several months, and when the discharge did appear, it was pale in colour and small in quantity; it lasted moreover but a day or two. Last winter, the flow as usual failed to appear for several months, and since the woman had at the same time become fatter than ever, Turkish baths and energetic muscular movements were prescribed. The result of this treatment was a striking one—abortion. After 17 years of marital intercourse she had for the first time become pregnant.

In the case of sterile women who are amenorrhoeic, even when the amenorrhoea has never been interrupted by a menstrual discharge, or when it appears entirely dependent upon obesity, it is nevertheless necessary to be extremely cautious in making a diagnosis, and above all in employing an intra-uterine sound. In such cases I have known the most eminent gynecologists unwittingly bring about abortion.

Cleveland, Godefroy, Haschek, Ritschic, Sommerus, Stark, Taylor, and Young, have all reported cases in which pregnancy occurred in women suffering from amenorrhoea; but all such cases must be regarded as quite exceptional. *Szukits* examined 8000 sexually mature women, and found among them fourteen only who had never menstruated. Of these, four were multiparae.

Saint Moulin reports the case of a woman 24 years of age who had never menstruated, but who none the less became pregnant and gave birth to a fine girl. One of the most striking cases of this nature is the one reported by *Rodzewitsch*, regarding a woman who first began to menstruate at the age of 36 years. This woman had however been married when fifteen years of age, and in the subsequent twenty-one years she gave birth to 15 children, remaining the whole time amenorrhoeic.

Puech reports the case of a woman who ceased to menstruate at the age of 40 years, and remained amenorrhoeic for the subsequent six years. Then menstruation recurred for a year, and finally ceased definitively in consequence of the occurrence of pregnancy, which terminated in the normal birth of a healthy boy. *Loewy*, in a woman 31 years of age, who had previously been amenorrhoeic all her life, saw menstruation appear for the first time shortly after the birth of her sixth child. *Ahlfeld* had under observation the case of a woman who was the mother of eight children, and had never menstruated.

Krieger reports the case observed by *Mayer*, of the wife of an artisan, who between the ages of 17 and 28 years had given birth to five children, and had had one abortion. After the age of 22, she had no trace of menstrual discharge, but notwithstanding this, she subsequently gave birth to three children. *Krieger* himself saw a woman who had had her last child at the age of 33, and in whom now, at the age of 48, menstruation had just ceased entirely. Two years later, irregular menstrual discharges recommenced; when these ceased, it appeared that the woman was once more pregnant, and she was normally delivered of a full-time girl.

Renaudin relates the case of a lady 60 years of age who gave birth to a child, menstruation having ceased 12 years earlier. *Deshayes* saw the delivery of a woman 50 years of age, two years subsequent to the occurrence of a normal menopause. *Capuron*,

quotes the case of a woman who became pregnant at the age of 65 years. In this case menstruation had recurred, having ceased many years before in a normal menopause. This woman aborted at three months, and the foetus was well-formed.

In such cases of late conception, which occur after the normal cessation of menstrual activity, we cannot be certain whether we have to do with a simple persistence of ovarian activity, associated with temporary or permanent cessation of menstruation; or whether both functions, ovulation and menstruation, had ceased, and were aroused to renewed activity by some determinate cause. It is possible that in coitus we have such a stimulus, capable of reawakening the slumbering ovarian functions. That this may be the case, we are led to suppose by the fact that pregnancy at an unusually advanced age most frequently occurs as a result of marriage late in life. In Scandinavian countries, where the difficulties of providing for a family are so great that a very large number of marriages are inevitably postponed till comparatively late in life, the number of pregnancies occurring in elderly women is correspondingly large. However, pregnancy late in life occurs also in women who have married early, and the most probable assumption to account for such cases is that ovulation has occurred in the absence of menstruation.

Although by these cases the proposition is established that amenorrhoea is by no means equivalent to incapacity for ovulation, still, the former must indubitably be regarded as in general a most important indication of disturbed ovulation. When a woman attains the age of 20 years without having ever menstruated, or even having experienced menstrual molimina, we may in the great majority of such cases infer with justice that there is complete or partial failure of development of the ovaries and the reproductive apparatus generally. In some of these cases, examination discloses the fact that the uterus is in an infantile condition. When we are able to bring about the regular establishment of menstruation, we may hope also to remove the sterility dependent upon the defective ovarian functional capacity. General tonic treatment for the relief of chlorotic amenorrhoea quite as often, in the case of previously barren married women, results in the occurrence of pregnancy, as happens in cases of amenorrhoea and sterility due to obesity, when this latter condition has been relieved and menstruation has been reestablished by suitable dietetic treatment. Much less often is it possible to relieve the sterility of scrofulous (tuberculous) persons, for in the majority of such cases, in consequence of the scrofulous (tuberculous) constitutional disorders, pathological changes have occurred in the ovaries already in early youth, and these it is difficult or more often impossible to remove.

Scrofula (tuberculosis) is, according to my own experience, the constitutional disorder which of all most frequently and most seriously affects ovulation; and it appears that the ovaries are subject to changes produced by this disease similar to those which occur in other glandular organs. In cases in which no cause of the existing sterility is ascertainable, the presence of scars due to scrofulous (tuberculous) changes in the lymphatic glands may serve as an indicator to show that the capacity for ovulation has been annihilated or seriously diminished in early life by scrofulous (tuberculosis) disease.

Among the causes of sterility, these three conditions: anaemia, chlorosis, and scrofula (tuberculosis), play a leading part; indeed, their importance in this connexion has hitherto been underestimated, more especially in regard to the comparative frequency with which they cause sterility. A large part of the favourable influence in the relief of sterility in women which is exercised by the "cures" at various watering places, depends upon the amelioration which is thus effected in the aforesaid constitutional disorders.

It has been assumed that diabetes, which renders men impotent, is competent also to cause sterility in women. *Hofmeier* reports a case which appears decisive on this point. In a woman 20 years of age, who had menstruated regularly since she was 14 until a year previously, when the flow had ceased, he found the uterus extremely small, barely 5 cm. (2 in.) in length, extremely atrophied, the ovaries also atrophied and very small; the urine contained large quantities of sugar. Here was doubtless a case of atrophy of the reproductive organs secondary to diabetes.

In England, where the excessive use of alcohol is observed very frequently in women as well as in men, sterility has frequently been regarded as a result of chronic alcoholism. *Matthews Duncan* reports cases which lead to the belief that alcohol has a specifically deleterious effect upon fertility. Apart from the general or constitutional disturbances dependent upon the abuse of alcohol, this agent has in many cases a well-recognized pathogenic influence upon the female reproductive organs, the morbid condition which is most frequently and most readily assignable to this cause being chronic oophoritis. The obesity which so frequently results from alcoholic excess is a contributory cause of sterility.

Certain drugs, more especially quinine and morphine, are reputed to cause sterility. *Davies*, reviving an old opinion, considers that of all drugs tannin is the most effective in leading to sterility, and he considers tea-drinking as responsible for this effect.

The influence of certain cerebral affections and psychical disorders in checking ovulation has been established. Thus, *de Montyeul* has recently shown that in families subject to hereditary mental dis-

orders, there is an unusually large proportion (1:7) of barren marriages.

In addition, there are many influences which are known to prevent or to diminish ovulation in the case of the lower animals, and which may therefore be assumed with considerable probability to have a similar effect in women. More especially we are here concerned with external influences affecting unfavourably nutrition and innervation, and therewith also ovulation; also near kinship between the parties to the act of intercourse; and finally hereditary predisposition. In animals, captivity, exposure to cold, over-exertion, insufficient or unsuitable food, and inbreeding, have been proved to result in infertility.

Doubleday asserted that "a too abundant supply of nutriment hinders reproduction, whereas on the other hand insufficient or improper food favours reproductive activity and increases the number of the offspring." *Spencer*, however, rightly points out that the infertility noticed in these circumstances is not the direct result of prosperity, but depends upon the pathological obesity which is thus engendered by overfeeding.

No less interesting are the observations that have been made regarding sterility in animals in confinement. In such animals there are wide differences. Some refuse to cohabit, or have lost sexual desire; others, again, show excessive sexual desire and cohabit too often, without any result; or even if fertilization occurs, abortion often ensues. In yet other cases, though conception follows intercourse, and the animals go on to full term before delivery, the young are still-born, or are weakly and misshapen. Caged birds often lay no eggs at all or very few; or if they do lay, they neglect their eggs; or if incubated, the eggs fail to hatch out. In France, experiments regarding this matter were made with domestic fowls. If the hens were given great freedom, 20 per cent only of the eggs remained unhatched; with less freedom, 40 per cent of the eggs were failures; whilst if the fowls were kept in a coop, 60 per cent of the eggs were unhatched.

"Convincing proofs," writes *Darwin*, "have been obtained to the effect that wild animals which have recently lost their freedom have their fertility diminished to a most remarkable extent. This infertility is not dependent upon any degeneration of the reproductive organs. There are many animals of the most diverse species, which, whilst they copulate freely in confinement, fail in these circumstances to conceive; others again, even if they conceive and have living young, give birth to these in numbers which are unquestionably much smaller than would be the case were the parents in the free state."

Interesting observations have been made by pigeon breeders.

They state that when pigeons brought up in the same nest pair, the number of their offspring is usually very small.

The influence upon fertility of unfavourable conditions of temperature, either excessive heat or excessive cold, is very great. In the case of pigeons, for instance, if the pigeon cot is adjacent to the heated wall of a dwelling house, the pigeons sometimes begin to lay as early as January, and may have young as often as eight times in a single year. When the dovecot is cold, on the other hand, the number of broods is smaller. In general, the procreative capacity is greater in summer than in winter.

As regards inbreeding, many facts are on record showing the influence of this practice in leading to the birth of malformed offspring and to sterility. *Darwin* writes, "if in a pure race, characterized by a certain tendency to sterility, we allowed only brothers and sisters to pair, in a few generations the stock would become extinct." If animals closely related by blood pair, the number of their offspring is always less than the average.

In the case of the human species, however, the influence of the marriage of near kin in diminishing fertility cannot be regarded as definitely proved.

Occasionally the incapacity for ovulation and the sterility dependent thereupon are hereditary—paradoxical as this may appear. It is necessary to assume, that just as the sperm is at times unsuited for effective fertilization, so also the ova may be in a less or greater degree insusceptible of fertilization. In the present state of our knowledge, indeed, we are not in a position to be precise as to the exact nature of such incapacity. It is possible that the enveloping membrane of the ovum varies in its resistance to penetration, as *Schenk* claims to have proved in respect of certain of the lower mammals. In his experiments on artificial fertilization outside the body of the mother, he ascertained that the cells derived from the discus proligerus, surrounding the ovum in immediate contact with the zona pellucida, are in some instances easily separable one from another, so that the spermatozoa can readily obtain access to the zona pellucida; whereas in other instances, in which the ovum is of the same size and apparently in the same stage of maturation as before, these cells remain closely attached each to the other, and thus prevent the passage of the spermatozoa. This condition of the ovum, so unfavourable to fertilization, may be hereditary in certain families, and its transmission may render certain members of the stock infertile. Such instances as the following from my own practice are by no means rare. Of three sisters, whose family life was intimately known to me, one had one child only, a girl, whilst the two others remained childless. The girl of the second generation married and remained childless. In England it is well estab-

lished that when, in cases of only-child-sterility, the offspring is of the female sex, this child will probably herself be barren. *Galton* found that in the case of 14 heiresses (i. e. the only children of wealthy parents), all of whom were married, 8 remained absolutely barren, whilst of the others, 2 had each an only child.

It was formerly believed that when a woman gave birth to twins of opposed sexes, the female infant would prove to be barren, this barrenness being associated with defective development of her reproductive apparatus. *John Hunter* (*Animal Economy*) ascertained that in the case of twin calves of opposed sex, the genital organs of the female twin were almost invariably imperfectly developed. But the supposition that this is true also of the human species has not been confirmed by experience. I know several married women who had twin brothers, and these women have borne normal children; however, the number of their offspring is remarkably small. *Simpson*, in Edinburgh, recorded the results of the marriage of 113 women who had been born with twin brothers; of these, 103 had proved fruitful, and 10 (i. e., about one eleventh of the whole) barren, although of these latter women, one had been married upwards of 5 years, and the remaining 9 for periods ranging from 10 to 40 years. *Simpson* also gave the history of four women who were all the fruit of triple births, some of which had consisted of two boys and one girl, others of two girls and one boy. All four of these women were parous. Again, a woman who had been one of a quadruple birth (three boys and one girl), herself gave birth to triplets. A collection of all the figures accessible to me relating to this subject, indicates that about ten per cent of the women born in such circumstances prove barren—a ratio which corresponds closely with the ratio of infertility in general.

Interference with Conjugation, Conditions Preventing Access of the Spermatozoa to the Ovum.

A condition essential to fertilization is a material union between the sexual products of the male and the female respectively—the act of conjugation. Thus, all conditions which prevent the spermatozoa from obtaining access to the ova, bring about sterility.

Spermatozoon and ovum being normal, a great variety of pathological conditions may prevent the one from gaining access to the other. It is necessary for fertilization that the mature ovum should leave the ovary, enter the Fallopian tube, and there come into contact with the male sperm. Interference with any one of these essentials may lead to sterility.

Thus, the constitution of the ovum itself may be at fault; or the entrance of the ovum into the Fallopian tube may not be normally effected; defects in these earliest stages of the process of fertilization

are precisely the commonest and the most important. The emergence of the ovum from the graafian follicle may be rendered difficult or entirely prevented by pathological states of the ovary; again, by inflammatory processes in the ovary, the tubes, or the ligaments, by developmental defects in the tube, and by obstructions in its interior, the entrance of the ovum into the tube, and its free passage along the tube may be prevented. Numerous abnormalities and diseases of the uterus may on the one hand prevent the entrance of the ovum into the uterine cavity, and on the other may prevent the upward passage of the spermatozoa to their goal. Amongst conditions competent to produce these effects we must enumerate: displacements of the uterus, structural changes in this organ and its annexa, and other congenital defects and acquired states; more particularly must be mentioned, uterus infantilis, acquired atrophy of the uterus, flexions and versions of the uterus, new-growths and inflammatory states of that organ, abnormalities in the shape or size of the cervix uteri, and, finally, all conditions of the vagina or vulva which hinder the proper performance of the act of intercourse.

In diagnosing the cause of sterility, in determining whether in any particular instance it is due to some hindrance to the indispensable conjugation between the male and female reproductive elements, we have in the first place to ascertain the presence or absence of any of the numerous conditions which interfere with the proper passage of the ovum from the ovary through the Fallopian tube to the interior of the uterus. The simpler mechanical hindrances to conception, such as displacements of the uterus, or tumours of that organ or its annexa, are easily recognized; and the same is true of atresia of the cervix uteri, and of congenital or acquired stenosis of the vagina. When obliteration or stricture of the genital tract exists, a very careful examination, visual, digital, and instrumental, must be made, rectal examination not being forgotten. Not infrequently, amenorrhoea is attributed to ovarian disease, and only subsequently on local examination is the cause ascertained to be hymeneal atresia, with haematokolpos; many a woman has believed herself to be pregnant, until examination has disclosed the fact that the hymen is still intact, and that coitus has hitherto been effected through the urethra. The importance of these stenotic conditions as causes of sterility must not, however, be overestimated, for, although they are common among the hindrances to conception, the obstacle is by no means always insuperable.

Morbid changes in the secretions of the genital passages, whereby the vitality of the spermatozoa may be destroyed before they have time to reach the ovum and effect fertilization, are hard to diagnose, for the conditions upon which such changes depend have not as yet been adequately investigated.

Diseases of the Ovaries and the Fallopian Tubes.

Among the conditions which, although the maturation of the ovum proceeds normally to a conclusion, may prevent conjugation between the male and female elements, we must in the first place consider an abnormal condition of the tunica albuginea of the ovary, a thickening of this membrane in consequence of inflammatory processes or of new formation of connective tissue, whereby the dehiscence of the follicle is rendered difficult or entirely prevented. Such thickenings of the ovarian envelope are the residue of periophoritic processes.

Such a hindrance to conception may be permanent or transient, and thus the sterility dependent thereupon may be relative or absolute. Similar is the effect of inflammatory processes affecting the peritoneal investment of the uterus, the broad ligaments, and the peritoneum clothing the floor of the pelvis; these conditions, perimetritis, perisalpingitis, and pelvic peritonitis, resulting in the formation of thick and extensive pseudomembranous bands, or in less severe cases leaving merely slight adhesions and filaments, which drag the uterus and the ovaries out of place, and thus render conception difficult or impossible.

Perimetritic adhesions are apt to lead to dislocation of the tubes either forwards or backwards, and most commonly into the pouch of Douglas, thus giving rise to sterility. *Rokitansky* and *Virchow* already insisted on the great importance of perimetritic processes in causing sterility.

That congenital defects of the Fallopian tubes may lead to sterility, is indeed a possible, but certainly a rare occurrence. The defect may be unilateral or bilateral; or it may be that merely a portion of one tube may be wanting. Bilateral absence of the Fallopian tubes is usually associated with defective development of the uterus, while the ovaries may be apparently normal. Such a case is described by *Foerster* and *Kussmaul*. The vagina opened into the urethra, the uterus was not calibrated, and diverged above into two solid horns, to which the round ligaments and the ovaries were attached. A congenital cause of sterility is to be found also in atresia of the tubes, the abdominal extremities of which are closed; this condition is met with also in other mammals. It is also assumed, with less accuracy, that a supernumerary ostium tubae may lead to sterility, in consequence of the ovum, which has found its way into the normal ostium, returning into the abdominal cavity through the supernumerary orifice. An unfavourable influence upon fertility is exercised also by a form of hyperplasia of the tubes which sometimes arises in consequence of erroneous development at the time of puberty; the tubes, increasing unduly in length, become serpen-

tine in form instead of being nearly straight; this tends to lead to accumulation of the secretions, and renders the passage of the ovum difficult. (*Frcund.*) Yet another defect of development which, as *Klebs* has pointed out, may lead to sterility, is absence of the fimbria which normally retains the abdominal orifice of the Fallopian tube in proximity with the ovary, in which case these structures may be separated by a wide interval.

The entry of the ovum into the tube may thus be rendered difficult by abnormalities of the abdominal orifice of the tube or of the fimbriae; but still more is this the case when the mucous membrane of the tube is diseased. The fringed border of the tubal orifice has a distinct tendency to independent disease. As *Klebs's* anatomico-pathological studies have shown, inflammatory changes are common in this region, leading to contraction. The free margin of the tube then appears to be strictured by over-growth of fibrous tissue on the serous surface, the opening being thus narrowed or even entirely closed, whilst the fimbriae themselves may be drawn within the aperture. In other cases, the ring of fimbriae is adherent to some neighbouring part, especially to the ovary itself, when this also is diseased. Further, on the fringed margin of the tube we see papillary growths, telangiectases, or oedema with formation of cystic cavities.

In the interior of the tubes also, pathological processes occur, catarrhal inflammations, haemorrhagic or purulent exudations, sealing up the passage completely. In some cases these exudations lead to great distension and even to rupture of the tube. Thus, among the causes of sterility must be enumerated: simple catarrh of the tube, with swelling of the mucous membrane; purulent catarrh, leading to its distension with pus—pyosalpinx; serous effusion into the tube, hydrosalpinx; and haemorrhagic effusion, haemato-salpinx; further, that peculiar form of tubal inflammation, described by *Chiari* and *Schauta* under the name of salpingitis isthmica nodosa, in which hyperplasia of the muscular coat of the tube occurs at irregular intervals, so that it appears to be beset with nodes. Special mention must also be made of gonorrhoeal salpingitis, which will subsequently be described in detail.

Inflammatory states of the tube may hinder conception, either mechanically, by swelling of the mucous membrane, or by obstruction of the lumen of the tube by exudations, by injury or destruction of the ciliated epithelium, by lesion of the musculature of the tube, affecting its peristaltic movements—all these hindering or entirely preventing the passage of the ovum downwards or of the spermatozoa upwards; or, again, chemically, by the deleterious influence of many of the morbid secretions that are formed in these conditions upon the vitality of ova or spermatozoa. These inflam-

matory states of the tubes may also lead to stricture or obliteration of their abdominal extremities, or to displacement of the ostia, and thus lead to sterility; in other cases these same conditions, leading to distortion and displacement of the tube, may prevent the downward passage of the ovum while leaving possible the upward passage of the spermatozoa, and thus give rise to tubal gestation—a condition which we shall not now consider.

It must not be forgotten that tuberculosis of the genital canal attacks the tubes with especial frequency; in these organs we may find miliary tubercles, and more commonly diffuse caseous masses, completely filling the lumen of the canal. Finally we have to mention the diverse forms of saccular dilatation of the tubes (Ger. "*Tubensäcke*"), all of which possess the common pathological characteristics of enlargement of the tubes and their conversion into saccular cavities; the contents of these distended tubes may, however, be extremely various, and such conditions may depend upon manifold mechanical disturbances and inflammatory processes of the uterus and its annexa.

When we consider how common, during the sexual life of women, are perioophoritic inflammations, more or less intense, but often without severe symptoms (and hence apt to be overlooked); when we remember that the very process of ovulation and also the puerperal state furnish opportunities for slight or severe pelvic peritonitis to arise; and when we further take into account the frequency and importance of gonorrhoeal pelvic peritonitis—we cannot fail to admit that the results of these morbid conditions, such as adhesions between the ovary and the ostium tubae, or closure of the tube with consequent hydro- or pyosalpinx, must be reckoned among the principal causes of sterility. If the frequency and importance of these conditions is still underestimated, two reasons can be adduced for this: first, that the slighter degrees of intrapelvic inflammation often, as previously mentioned, elude diagnosis; and, secondly, that even when the treatment is expectant merely, the exudations are frequently absorbed, the adhesions give way, and the capacity for conception is gradually fully restored.

When considering the etiology of acquired sterility, especial attention must be devoted to gonorrhoeal pyosalpinx, the most important and the most dangerous of the morbid manifestations of gonorrhoeal infection in the female. Gonorrhoeal salpingitis and perisalpingitis are very serious affections, in the first place because they are apt to give rise to oophoritis and perioophoritis, as well as to pelvic peritonitis, and other local inflammatory states. The minuteness of the uterine orifice of the Fallopian tube, and the downward direction of the ciliary movement in the interior of the tube, combine to safeguard against the entrance of gonococci, but none the less they too

often find their way up the tube, and small quantities of gonorrhoeal pus enter the pelvic cavity and give rise to inflammations, in which the ovary partakes.

According to *Saenger*, this gonorrhoeal disease of the uterine annexa is found with especial frequency in women either wholly sterile or affected with only-child-sterility, and is to be regarded as the cause of their infertility; "infertility is indeed the rule, fertility the exception, in all cases in which gonorrhoeal disease has passed upwards beyond the os uteri externum." The same author maintains that, putting aside tuberculosis and actinomycosis, if, in a case of infective inflammation of the uterine annexa, septic infection can be excluded, and more especially when the disease affects both tubes, when it is reluctant to yield to treatment, and when relapses are frequent, we have no option but to believe that the affection is of gonorrhoeal origin.

In 155 cases of chronic inflammatory disease of the Fallopian tubes, *von Rosthorn* was able in 37 instances to prove that the affection was the direct result of gonorrhoeal infection.

Recently, however, *Noble* has published cases which lead us to believe that even pyosalpinx does not necessarily prevent the occurrence of pregnancy. In operating for the relief of a unilateral pyosalpinx, the uterus was opened, and a seven months' foetus was removed. In another case, the autopsy on a woman who had succumbed to severe peritonitis arising immediately post partum, disclosed a large pyosalpinx.

Closure of the ostium may also be brought about by chronic metritis and endometritis, by chronic catarrhal states of the uterine mucous membrane, and in general by pathological changes in that membrane associated with local hyperaemia or abnormal secretions. In some cases, salpingitis with consequent sterility is the result of puerperal infection; and such a sequence of events is especially common after an abortion followed by retroflexion of the uterus, leading to elongation and kinking of the tubes.

An important hindrance to the entry of the ovum into the uterus is sometimes offered by uterine polypi or myomata; growing from the fundus, these may so fill the uterine cavity that the uterine orifices of the tubes appear to be completely occluded.

At times, also, quite small myomata, growing close to the tubes, may push these latter upwards, closing them, and thus giving rise to sterility; such myomata may also lead to saccular dilatation of the tubes, as occurred in the following case:

Mrs. S., aged 39 years, had one child when 20 years of age, but since then had been barren. For several years she had suffered from profuse menorrhagia. Owing to the enormous thickening of the abdominal wall, bimanual examination of the uterus was impossible;

the vagina was relaxed, enlarged, and contained an excess of mucous secretion. The uterus was high up in the pelvis, anteverted, enlarged, movable, sensitive to pressure; the portio vaginalis was enlarged, soft, and excoriated; no tumour could be detected either in the uterus or in the uterine annexa. The menstrual flow recurred at intervals of from two to three weeks, lasting from one to two weeks, and being extremely profuse; menstruation was painful. Whilst the patient was under my observation an excessive menstrual haemorrhage came on quite suddenly, with slight rise of evening temperature (38.2° C.— 100.8° F.), but severe general disturbance; there were paroxysms of intense abdominal pain, violent vomiting of greenish bilious masses, which after a time became haemorrhagic, the abdomen was tense and sensitive to pressure, there was cardiac weakness with general failure of strength; treatment proved unavailing, and the patient died in collapse on the third day. The autopsy disclosed: fibroma uteri submucosum, parietale, et subserosum, haematosalpinx dextra, pyosalpinx sinistra, peritonitis. The subserous myoma, of about the size of a pea, was in the middle of the fundus uteri; the submucous myoma, of about the size of a chestnut, filling the uterine cavity, sprang from the posterior wall of the body of the uterus; the intramural myoma, of about the size of a bean, was in the right wall of the corpus uteri. Both tubes were greatly elongated, exhibiting serpentine windings. The right tube was much distended, filled with sanguineous fluid; the left, partially collapsed, contained greyish-green purulent material, having an extremely offensive odour; some of this fluid had flowed through the ostium abdominale into the abdominal cavity. Death in this case ensued with great rapidity in consequence of rupture of the pyosalpinx, and evacuation of its contents into the abdominal cavity.

Cystic formations in the round ligament (hydrocele of the round ligament) sometimes lead to sterility. In the form of elongated tumours of about the size of a hen's egg they may fill the inguinal canal, and even pass forwards into the labia majora. When as large as this, they demand operative interference. *Hennig* records a case in which such hydrocele of the round ligament was the cause of sterility lasting 14 years, the woman becoming pregnant after the tumour had been removed by operation. Similarly, infertility may depend upon solid tumours of the round ligaments — myomata, fibromyomata, or sarcomata.

Retro-uterine haematocele often gives rise to sterility. As a rule, prior to the formation of a blood-tumour in the pouch of Douglas, various menstrual disturbances occur, more especially menorrhagia; or it may be preceded by some puerperal disease, especially perimetritis, which by itself, indeed, seriously limits the fertility of the woman thus affected; but when haematocele is superadded, her child-

bearing capacity is much more gravely impaired, owing to the permanent displacement of the uterus, to the perimetritic exudations, to the adhesions formed around the ovary, and to stricture or occlusion of the tubes. Still, sterility is by no means an inevitable consequence of haematocele.

By many it is assumed that in cases in which the tubes are perfectly normal, disturbances of innervation are competent to cause sterility (or tubal gestation). It is supposed that nervous influences affect the functions of the Fallopian tubes by leading to spastic contractures of the circular muscular fibres of these structures, or in other cases to paralysis; in this way nervous disorder may lead to the retention within the tube of the unfertilized (or already fertilized) ovum.

Diseases of the Uterus.

Pathological changes in the uterus may in various ways lead to sterility dependent upon prevention of conjugation (physical contact of the male and female reproductive elements). Thus, the incapacity for fertilization may, on the one hand, depend on hindrances to the passage of the ovum from the tube to the interior of the uterus; or on the other, on some abnormal condition of the vaginal portion of the cervix, whereby the passage of the spermatozoa from the vagina into the uterus is prevented; or, finally, upon displacements of the uterus or pathological structural changes in that organ, whereby the implantation of the fertilized ovum in the uterine cavity and its development therein are impeded.

The uterus may be entirely absent, but this is an extremely rare condition; much less infrequent is a rudimentary condition of that organ. In the latter case, it is either represented by a nodular rudiment, or else it is conical or bicorned; whatever its shape, it is a solid mass of muscular and connective tissue. In association with absence or a rudimentary condition of the uterus, the vagina also may be wanting, or may be represented merely by a small, blind pouch; the Fallopian tubes may in such cases either be normally developed or rudimentary. The number of instances of this kind that have been observed is very large (*Kussmaul, Klebs, Cusco, Klinkosch-Hill, Cruise, Freund, Fürst, Engel, Güsserow, Nega, Kiwisch, Rokitansky, Braid, Jackson, Lucas, Duplay, Dupuytren, Renaudin, Crédé, Saexinger*, and many others).

The uterus and the vagina may be absent in cases in which the vulva is developed in a perfectly normal manner, with a mons veneris projecting as usual, and covered with a proper growth of hair. *Ormerod* and *Quain* have reported cases of this kind, in which the external sexual characters were those of a fully mature, perfectly developed woman, but in whom the uterus and ovaries were entirely wanting.

These defects of development necessarily entail complete sterility. Sometimes during life the cause of the sterility is entirely overlooked, and only discovered by chance or in post mortem examination. Although the vagina usually shares to a marked extent in the defects of the uterus, and at puberty undergoes a rudimentary development merely, the marital intercourse of such individuals commonly appears to be perfectly normal. As a result of frequently repeated and vigorous attempts at intercourse, the rudimentary vagina becomes accommodated to the needs of the case; and even when the vagina is absent, the rudimentary depression by which it is represented becomes distended into a large blind sac capable of accommodating the erect penis. In other such cases, the penis finds for itself some abnormal channel, and the husband may continue to indulge in intercourse for a long period without discovering that there is anything unusual. Sometimes it is the urethra which becomes dilated and takes on in part the function of the vagina; in other cases intercourse is effected per anum.

The following most remarkable case came under my own observation. The patient's husband was a physician, who nevertheless was in complete ignorance of his wife's abnormalities. The woman was 26 years of age, of medium stature, somewhat obese, breasts moderately well developed, pubic hair well grown. She stated that before marriage she had menstruated regularly, and that it was only after she had married four years previously that menstruation had ceased — statements which were unquestionably false. She consulted me on account of amenorrhoea and sterility, which her husband believed to depend upon her increasing obesity. Examination showed that the vagina admitted two fingers and was 10 cm. (4") in length; but it was completely blind, and the mucous membrane was strikingly smooth. On bimanual examination, only a rudiment of the uterus could be detected, a mass no larger than a hazel-nut; the ovaries could not be felt.

A similar case is recorded by *Heppner*. A Finnish peasant woman 31 years of age consulted him on account of amenorrhoea and sterility. She had been married for 12 years, and neither before marriage nor since had menstruated or had had any periodic vicarious bleeding. The pubes and the labia majora were thinly covered with hair; the latter were very flaccid and but slightly prominent; the nymphae hung down like an apron for as much as an inch below the genital fissure, and were very thin; the clitoris was but slightly developed. The urethral papilla was of normal size, the lacunae around it were extremely well marked; the urethral orifice had the form of a zigzag slit. Behind this latter was an aperture environed by radiating folds, and this was the entrance to

a blind passage about two inches in length; this aperture could not, however, be identified as the introitus vaginae, for the reason that there were no carunculae myrtiliformes, and moreover the callosity of the mucous membrane characteristic of the vaginal orifice was wanting. Behind the strongly projecting commissura labiorum, however, the fossa navicularis appears as a separate depression. The blind passage was clothed with a soft, pale-red mucous membrane, and was entirely devoid of any trace of columnae rugarum; at the extremity of this passage there was neither scar nor induration. On rectal exploration, no trace of uterus, normal vagina, or ovaries could be felt, notwithstanding the fact that the abdominal walls were very flaccid and examination was therefore easy. The general configuration was feminine, the breasts were flabby and dependent, the waist and hips were those of a woman.

Tauffer reports the case of a woman 25 years of age, married 2½ years, absolutely amenorrhoeic; on examination she was found to have atresia vaginae with rudimentary development of the uterus. The breasts were small, the mons veneris was deficient in fat, but thickly covered with hair, the labiae and the clitoris were normal.

R. Levi describes a case in which, in a patient 19 years of age, the uterus was wanting, though the general physical development was that of a normal woman. The breasts were well formed, and so also were the external genital organs; a blind passage 4 cm. (1.6 in.) in length, and admitting two fingers, represented the vagina. In the position normally occupied by the ovaries, were two bodies which were doubtless the rudiments of these organs. Menstrual molimina had never been experienced.

Von Hoffmann, in making a post mortem examination on an elderly married woman, found that the vagina ended blindly at a depth of 6 cm. (2.4 in.), whilst the uterus was represented merely by a pyramidally arranged bundle of fibres in the broad ligament. *Lissner* reports a case in which the physician was the first to draw the husband's attention to the fact that his wife had no uterus.

Ziehl, in a married woman 57 years of age, found that the uterus was completely wanting; the vagina ended blindly half an inch from the surface; the tubes and ovaries were present. *Boyd*, in a married woman 72 years of age, found a blind vagina half an inch in length, and the uterus represented by a nodular rudiment on the posterior wall of the bladder.

Rare cases are also recorded in the literature of the subject, in which, notwithstanding the absence of the uterus, normal ovaries were present, and in these latter periodic ripening of the graafian follicles took place. A case of this kind was described by *Burg-graeve*.

Complete sterility is entailed also by a persistence of the foetal

condition of the uterus. In these cases, the uterus retains the form it possessed at the beginning of the second half of intra-uterine life. The portio vaginalis projects but slightly into the vagina, and the os uteri externum appears as a small rounded opening. The cervix is comparatively long and wide, and the folds on the mucous membrane of the cervical canal are fully formed. The body of the uterus is imperfectly developed, triangular in shape, with thin walls; it is shorter than the cervix, and its interior is marked by folds of mucous membrane converging towards the os. In these cases menstruation is absent or scanty; the other reproductive organs, including the breasts, are usually in a state of arrested development. Women with foetal uterus are capable of sexual intercourse, and carry on most of the functions of their sexual life in a manner apparently normal; they are, however, invariably sterile.

An analogous cause of sterility is presented by the condition known as uterus infantilis, in which at puberty the uterus fails to undergo the changes proper to this period, and remains in the condition characteristic of infancy. The cervix is disproportionately large, whilst the body of the uterus is cylindrical in form, and the mucous membrane lining its cavity is always smooth. The muscular substance is unduly thin. The vagina may be normal, sometimes, however, it is narrow, and the mucous membrane is less rugose than normal. Associated with an infantile condition of the uterus we find commonly, but by no means invariably, imperfect development of the external genital organs, the labia, the clitoris, and the vagina; the mons veneris is but thinly covered with hair; the breasts are small. As a rule, menstruation is entirely wanting. Occasionally the ovaries are wanting. This infantile condition of the uterus is by no means extremely rare. According to *Beigel's* figures, among 155 sterile women, in four the uterus was infantile.

Among 200 cases of sterility in which it was possible for me to make a searching enquiry for the cause, I found 16 instances of infantile uterus. Neither in the general physical configuration of these women, nor in the state of their menstrual functions, was there any striking abnormality; in the condition of the external genital organs, however, in cases of defective development of the uterus and ovaries, certain striking peculiarities were, in my experience, almost invariable, and deserving therefore of close attention. The mons veneris was extremely small, sometimes completely bald, or covered very thinly with hair; and the hair when present, did not exhibit the curliness usually seen in the pubic hair of married women. On examination, the uterus, small in all its diameters from arrest of development, could in every case be detected.

How exceptional it is in adult females with well developed internal reproductive organs for the pubic hair to be scanty or completely

wanting, has been shown by the investigation recently made by R. *Bergh* on this hitherto neglected subject. In 2200 individuals engaged in clandestine prostitution, he found the pubic hair extremely scanty in 148, and the genital region nearly or completely bald in 6. He states that early vigorous growth of the pubic hair is a trustworthy sign of early sexual development; but he remarks that the opinion of *Aristotle* that women in whom the pubic hair is slight or absent are always sterile, is erroneous.

NOTE.—The author's statement regarding the extreme infrequency of absence or deficiency of the pubic hair in women with properly developed internal reproductive organs, while true of European women, does not apply to all races. In Japanese women, for instance, the pubic hair is as a rule much scantier than in European women; and baldness, complete or nearly complete, of the *mons veneris* is by no means uncommon. It is the exception, in Japanese prostitutes, to find a thick and vigorous growth of genital hair.—*Transl.*

In the Talmud, there is an interesting reference to this subject, to the effect that it may be assumed that a woman is sterile if by the 20th year of her life the pubic region be not yet covered with hair, if the breasts be not developed, if coitus be difficult, and if the tone of the voice be masculine.

Madame *Boivin*, *Dugès*, *Lumpe*, and *Pfau*, maintain that the development of the uterus from the infantile condition to that characteristic of the sexually mature virgin, often occurs very late and very slowly; and that women in whom we find the uterus in an infantile condition, may later begin to menstruate and may become pregnant. It has been suggested that in these cases there has been confusion with primary acquired atrophy of the uterus. Still, that it is necessary to be most cautious in cases of infantile uterus in asserting that a woman is permanently sterile, has recently been forcibly impressed on me by a remarkable instance. A married woman consulted me some years ago on account of amenorrhoea and sterility; examination showed clearly that the uterus was in the infantile condition, and for this reason, not I alone, but several leading gynecologists, assured her that there was no hope of her ever becoming a mother; recently, however, after ten years of sterile wedlock, she was safely delivered of a healthy child.

A sub-variety is constituted by the uterus pubescens, a uterus which indeed at puberty has undergone a certain degree of development, but has failed to attain the normal size; in such cases the menses are regular, but sometimes painful. This form of arrest of development of the uterus may occasion sterility, which, however, often proves curable when by frequent sexual intercourse and the congestion dependent thereon, the genital organs have been stimulated to the completion of the process of development; the

muscular strength of the uterus then becomes adequate, and the dysmenorrhoeic troubles disappear. In general it may be said that if the rudimentary or imperfectly developed uterus is at all competent to carry out the function of gestation, the necessary changes sometimes occur in the organ with remarkable rapidity, and result in normal pregnancy and parturition.

Uterus unicornis, when occurring alone, and not associated with other defects or errors in development, is not a cause of sterility. Women with a uterus unicornis, with or without an accessory horn, menstruate, conceive, and pass through pregnancy and parturition, in a perfectly normal manner; indeed, some women with this developmental defect have given birth to twins. The assumption that uterus unicornis predisposes to abortion does not always hold good. If, however, pregnancy occurs in a rudimentary horn, rupture of the membranes is inevitable, and the ovum or embryo passes into the abdominal cavity, with the usual accompaniment of fatal hæmorrhage. The rupture commonly occurs between the third and the fourth month of foetal life (months of four weeks each).

The uterus bicornis, with which may or may not be associated duplication of the vagina, does not as a rule offer any hindrance to conception; and the same statement is true also of the uterus bilocularis or septus. Women with these defects of development may give birth to healthy children; and some such women have had twins, each foetus occupying a separate half of the uterus. Still, births in cases of double uterus and vagina are rare occurrences. Such cases have been published by *Lasarewitsch*, *Litschkus*, and *Késmarsky*. In very rare cases of uterus bicornis associated with double vagina, an obstacle to conception is offered by the fact that one side only of the double vagina, the larger, is utilized in sexual intercourse, and that this is a blind passage.

In cases of uterus bilocularis seu septus, the conditions as regards pregnancy and parturition are similar to those that obtain in cases of uterus bicornis. The twin uterus, uterus didelphys, the condition in which the uterus is represented by two completely separated halves, each of which has developed into an independent organ, has been observed, as *P. Müller* has shown, in adults as well as in infants; this condition offers no obstacle to conception, unless, indeed, as occurred in a case of *Tauffer's*, the vagina is rudimentary, so that normal sexual intercourse is impossible. *Satschoma* reports a case of uterus didelphys in which pregnancy occurred simultaneously in both uterine cavities.

A careful distinction must be made between the congenital condition known as the infantile uterus (i. e., congenital atrophy) and acquired atrophy of the uterus, affecting the whole organ, or either

of its segments, the body or the cervix; the latter condition may offer merely a transient and curable obstacle to conception.

Acquired primary atrophy of the uterus occurs in weakly girls who, just before the age at which the uterus normally undergoes its transformation into the adult state, have suffered from constitutional disorders, from chlorosis or anaemia, or from some other exhausting affection. The uterus is then small, limp, and flaccid, it is usually anteflexed, with a small, often insignificant portio vaginalis; the anterior lip of this structure failing to project from the vaginal fornix; the vagina is usually short and narrow. This form of atrophy of the uterus is distinguished from the foetal and from the infantile uterus more especially by the fact that no disproportion exists between body and cervix, that the muscular wall is better developed, and that the general configuration of the uterus is rather that characteristic of the normal uterus of the sexually mature woman. Persons with primary atrophy of the uterus, are, moreover, backwards in the general development of their sexual characters; the breasts are small, the pubic hair is scanty, the menstrual flow is insufficient or entirely wanting, whilst severe dysmenorrhoeal manifestations are usual.

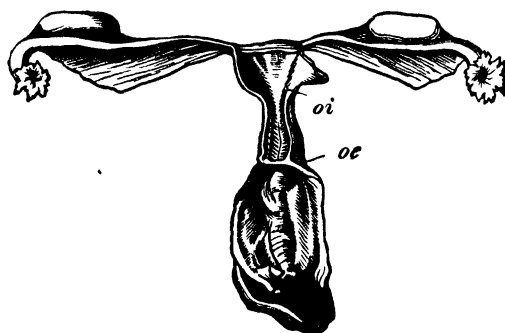


FIG. 70.—Congenital Atrophy of the Uterus (after Virchow). oi, Ostium internum; oe, Ostium Externum.



FIG. 71.

In favourable circumstances, when the constitution becomes more powerful, in these cases of primary atrophy of the uterus, improvement takes place; the uterus undergoes further development, menstruation becomes more abundant, and the woman may become pregnant. Such a favourable prognosis cannot, however, be entertained if a severe flexion of the uterus is associated with the atrophy of the organ; or if the ovaries are also atrophied.

Sterility results also from puerperal atrophy of the uterus. This condition is a sequel of severe puerperal diseases, metritis, para-

metritis, and perimetritis; sometimes, even in the absence of such inflammatory processes, it is due to puerperal hyperinvolution, occurring especially in women previously weak in constitution, and manifested by the fact that, notwithstanding the weaning of the child, the menstrual flow remains for months in abeyance. The uterus loses its firm consistency; it is sometimes shortened, sometimes of normal length, but the walls are always greatly thinned, so that, as *Schroeder* points out, the sound can be readily felt, through the abdominal wall. Puerperal atrophy is a curable condition, so that the sterility dependent upon this disease is not necessarily permanent. Thus, in a case of *P. Müller's*, a woman in whom a twin delivery had been followed by extreme atrophy of the uterus, with well-marked symptoms both objective and subjective, became once more pregnant eighteen months after the termination of the twin pregnancy.

Other forms of atrophy of the uterus have a similar deleterious effect to that exercised by puerperal atrophy, as, for instance, atrophy from the pressure of tumours of the uterus, or of solid ovarian tumours; or, again, atrophy due to defective innervation of the pelvic organs, occurring in various forms of paralysis, and characterised by amenorrhoea and extreme smallness of the uterus. *Von Scanzoni* has seen several cases in which young women, previously healthy and menstruating with regularity, have been attacked by paralysis of the lower extremities, and thenceforwards have suffered from amenorrhoea and great contraction of the uterus; in some of these cases a post mortem examination was made, and disclosed the existence of true atrophy of the uterus. *Jaquet* saw a similar case of atrophy of the uterus in a lady who had been frightened by witnessing the storming of a barricade in front of her dwelling; she was then in her 22nd year, and had given birth to her second child 1½ years previously; thenceforwards she was completely amenorrhoeic, and her uterus measured only 3 cm. (1.2 in.) in length.

Displacements of the uterus (flexions and versions), and abnormalities in the cervix uteri, are among the conditions which lead to sterility by interfering with conjugation—by preventing the necessary physical contact between the male and the female reproductive elements. The frequency with which these diseases give rise to sterility is, however, far from being so great as is commonly asserted by those who maintain a mechanical theory of conception.

Pathological Changes in the Cervix Uteri.

In very early times, the attention of physicians was directed to abnormalities in the shape of the cervix uteri, as offering hin-

drances to the entry of the semen into the uterus. Amongst the writers of antiquity who have alluded to this matter, the names of *Hippocrates* and *Soranus* must especially be mentioned.

The normal cervix uteri (Fig. 72) has the form of a flattened ellipsoid, perforated throughout its longitudinal axis. On making a longitudinal section of the cervical canal, we see that it is dilated in the middle, and tapers towards either extremity, having thus the shape of a spindle; the internal os is, however, somewhat smaller than the external. The latter (os uteri externum, os tincae, often referred to without qualification as "the os"), has normally the form of a transverse fissure, which, however, tends more towards the circular form, the smaller it is, and the more widely its margins are separated. In childhood, in consequence of the infolding of its margins, the external os has usually a radiated form, later it becomes rounded, and only with the attainment of sexual maturity does it assume the form of a transverse slit. This form is maintained throughout the epoch of active sexual life; but after the climacteric, owing to the separation of the margins of the orifice, it becomes once more rounded.

With regard to the greatly varying size and shape of the portio vaginalis, it may be said that in general its anterior lip *appears* the shorter of the two, owing to the lesser depth of the anterior vaginal fornix, but that in reality the anterior wall of the cervical canal is longer than the posterior; the actual length of the anterior lip of the portio vaginalis, measured from the summit of the anterior fornix, is from $\frac{1}{2}$ to 1 cm. (0.2 to 0.4 in.), whilst the posterior lip, from the summit of the posterior fornix to the end of the lip measures $1\frac{1}{2}$ cm. (0.6 in.) and upwards. The position of the cervix is such that, owing to the oblique direction of the long axis of the uterus, superadded to the absolutely greater length of the anterior lip of the cervix, the plane across the extremities of the two lips faces almost straight backwards. The axis of the portio vaginalis forms a right angle with the axis of the vagina; the cervical canal, however, is not usually straight, but has a slight S-shaped curvature. The mean length of the cervical canal in the virgin uterus is 3 cm. (1.2 in.). (*Lott.*)

The "ideal" form of the cervix uteri and of the os uteri externum is described by *Sims* in the following terms: "The vaginal portion should measure about one fifth, certainly not more than one fourth, of the entire length of the cervix uteri; that is, the anterior lip should have a length of one fourth to one third of an inch, and the posterior lip should be a fraction longer. The cervical canal should either be straight, or have a forwardly directed curve; the cervical axis should form a right angle with the vaginal axis; the cervix should not be markedly anteverted or retroverted." *Sims*

is of opinion that every woman whose uterus is in this condition will conceive within three or four months from the time when she first enters upon conjugal intercourse; he adds, however, the important proviso, "be it understood, that all else is in order."



FIG. 72.—Normal Portio Vaginalis.



FIG. 73.—Conoidal Portio Vaginalis.

In conception, the cervix uteri subserves the important function of providing for the free passage of the spermatozoa to the interior of the uterus; and when we consider the nature of the processes of sexual intercourse and fertilization, and more especially when we bear in mind that normally the two lips of the cervix and the upper segment of the vagina form a chamber for the retention of a portion of the seminal fluid in contact with the os uteri externum, we are readily led to assume that any great abnormality, in size of the cervix (enlargement or diminution), in its shape (malformation), or in its position (displacements — flexion, version, or prolapse), or, finally, stenosis of the cervical canal,—may offer mechanical hindrances to conception. An experience shows that this assumption is justified, at any rate as regards conical elongation of the portio vaginalis (Fig. 73), as regards an apron-shaped or beak-shaped hypertrophy of the anterior lip of the cervix (Figs. 74 and 75), as regards flexion upwards of the elongated cervix, and also as regards stenosis or obliteration of the external or the internal os; although the reservation must be made that no matter how unfavourable the shape of the portio vaginalis, no matter how extensive the changes in the cervix uteri, as long as a permeable upward passage for the spermatozoa exists, conception is still possible, and in exceptional cases may occur.

When the cervix is hypertrophic and greatly enlarged, and the vaginal fornix consequently much elongated, conception is rendered difficult, for the reason that in such cases, either the semen rapidly flows out of the vagina, or else a proper juxtaposition between the penis and the external os no longer occurs, and the semen is ejacu-



FIG. 74.—“Apron-shaped” Vaginal Portion. a. Greatly elongated anterior lip; b. Shorter posterior lip of the cervix.

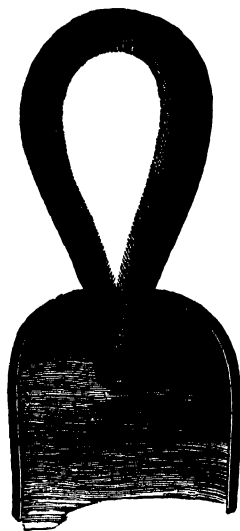


FIG. 75.—“Beak-shaped” Vaginal Portion. Posterior aspect.

lated at some distance from the os. The change in the shape of the portio vaginalis, and also the elongation of the cervical canal, are additional obstacles to the entrance of the spermatozoa into the interior of the uterus; as regards the former condition, in nulliparae the portio vaginalis is commonly conical, or pointed, whilst the external os is very small, thus rendering the passage of the spermatozoa a difficult matter; but in parous women, it is lobulated, owing to the presence of deep fissures, whereby the penis is conducted into the vaginal fornix, and the ejaculation of the semen in this locality is facilitated. Hence, such hypertrophy of the cervix and the portio vaginalis often coincides with the occurrence of sterility. The hypertrophy is less apt to cause sterility when it is limited to one lip of the cervix, unless, indeed, the affected lip (more commonly the anterior) is so greatly enlarged that it bends over and occludes the external os, whilst conducting the penis into the fornix and away from the orifice. Cases have been known

in which a single lip of the cervix was hypertrophied to such an extent as to protrude between the labia.

The commonest malformation of the cervix is the conical cervix, when the cervix is not merely elongated, but tapering; associated with this condition is usually found a notable diminution in size of the os uteri externum. According to *Sims* we find "conical cervix in 85% of all cases of natural sterility." According to the same author, even in the absence of the conical form of cervix, "sterility is probable in cases in which the portio vaginalis projects fully half an inch into the vagina; if the cervix projects more than one inch, sterility almost inevitably results; whilst if elongation is even greater than this, so that the vaginal portion measures from one and a half to two inches, sterility is absolutely certain."

On the other hand, congenital smallness of the portio vaginalis, the condition in which this organ appears merely as a slightly projecting nodule on the upper part of the anterior wall of the vagina, the anterior vaginal fornix being almost non-existent, and the posterior fornix very extensive—a wide cul-de-sac—is also unfavourable to conception. The probable reason is that, in consequence of this deformity, the semen, after being ejaculated into the posterior fornix, flows away down the posterior wall of the vagina, without coming into contact with the short portio vaginalis.

According to *Beigel*, another frequent cause of sterility is to be found in the existence of the so called "apron-shaped" portio vaginalis, the condition in which, either from congenital deformity, or else from hypertrophy or some other disease, one lip of the vaginal portion is so formed as greatly to exceed the other in length.

In consequence of hypertrophy, the portio vaginalis may assume other, very various forms; in some cases it may increase in size to such an extent that it projects into the vagina as a thick, hard ball, and thus offers a serious obstacle to the reception of the semen; or, again, in the form of the elongated, slender cervix, it may become doubled upon itself, and in this way hinder the passage of the spermatozoa (Figs. 76 and 77). Deformities of the cervix due to hypertrophy of the portio vaginalis, rarely cause congenital sterility, but more commonly the acquired form; for such hypertrophy is hardly ever congenital, occurs but rarely in virgins, and is usually met with in married women who have had difficult deliveries, and consequently have suffered from uterine disease.

Another deformity of the vaginal portion of the cervix which is important in its relations to sterility is the "snout-shaped cervix." Here the cervix is thinnest immediately at its insertion into the vaginal fornix, and thickens gradually below, so that the organ resembles a swine's snout in form. As a rule, this deformity is

due to diffuse hypertrophy of the connective tissue of the cervix, the result of chronic endometritis and cervicitis.



FIG. 76.— Simple Hypertrophy of the Portio Vaginalis, which projected from the Vulva.



FIG. 77.— Elongated Cervix, bent upwards.

Fritsch, however, in two cases of characteristic *col tapiroid*, saw pregnancy occur after the relief of the previously existing uterine catarrh; in one of these cases the condition of the organs was virginal, so that it was hardly possible to believe that the patient was a multipara; even after she had had three children, the os uteri externum with difficulty admitted the passage of the uterine sound.

Pajot has devoted especial attention to the hindrances that are offered to the entrance of the spermatozoa by displacements of the cervix. In these cases, during coitus, the extremity of the glans penis is not in contact with the os uteri externum, but passes into a kind of cul-de-sac; in retroversion the posterior fornix; in anteversion, the anterior fornix; in lateral version, the lateral fornix of the side opposed to that towards which the lower extremity of the cervix points.

Complete absence of the vaginal portion of the cervix puts difficulties, though not very serious ones, in the way of conception,

since the segment of the uterus which combines with the upper segment of the vagina to form a receptaculum seminis, is wanting. How important in predisposing to fertilization is efficient contact of the external orifice of the vaginal portion with the ejaculated semen during and immediately after intercourse, seems to be established by my own observation, that women of small stature married to men of average height exhibit much higher proportional fertility than women of average stature. In the case of these small women, the favourable circumstance is obvious, inasmuch as intimate contact is facilitated between glans penis and portio vaginalis. I have frequently heard complaints, from the husbands of such women, that a single coitus is sufficient to ensure conception; and again and again I have been informed by such women that they have had 10, 12, or 16 children. In one such instance known to me, the wife had been pregnant 23 times, and had given birth to 19 normal children. Contrariwise, women with a very long vagina, and with a high position of the portio vaginalis, do not so easily become pregnant.

Of special importance in the causation of sterility is stenosis of the cervical canal. This may be congenital, and then usually affects the whole length of the canal; or it may be acquired, being dependent upon inflammation of the mucous membrane. In these latter cases, the swollen follicles of the mucous membrane burst, and their granulating walls adhere. Other causes of acquired stenosis are trauma, severe operative procedures during parturition, puerperal inflammations, syphilitic ulceration, adhesion of the opposed granulating surfaces after operative measures (as, for instance, after severe cauterization, or after amputation of the portio vaginalis), and, in short, from scar-formations however caused.

General swelling of the tissues leading to stenosis occurs at the external os in hyperplastic uteri of virgin configuration; the small round orifice characteristic of the virgin uterus becomes narrowed, or even completely occluded, by the swelling of the tissues of the vaginal portion. True adhesion of the walls does not occur in these cases, but the minute aperture left by the swelling of the walls of the canal is plugged by the epithelium, so that a small blind depression in the centre of the portio vaginalis is all that remains of the cervical canal. Such a condition is seen with especial frequency in cases of prolapse of the vaginal portion, and is often erroneously regarded as an obliteration of the os uteri externum by epithelial adhesion (*Klebs*). Finally, stenosis of the cervical canal may be caused by tumours, and also by the flexions and versions of the uterus presently to be discussed.

Congenital atresia of the uterus is generally associated with other developmental anomalies of the reproductive organs. In some cases,

all that is at fault is that the mucous covering of the vaginal portion passes uninterruptedly from one lip to the other; but in others, the cervix is unperforated throughout, and the vaginal portion is but slightly developed.

Acquired obliteration of the cervical canal may affect either the external or the internal os, with a shorter or longer portion of the rest of the canal. When very extensive necrosis of tissue has occurred, as a sequel of difficult delivery, the adhesion may include the adjoining segment of the vagina (utervaginal atresia).

The more marked the stenosis of the cervical canal, the smaller the passage by which the vagina communicates with the uterus, the more difficult will it be for the passage of the spermatozoa to be effected, so that of the millions of spermatozoa deposited in the neighbourhood of the os uteri, thousands will, as in normal cases, find their way to the uterine orifices of the Fallopian tubes. So much the more, then, is the contact between spermatozoon and ovum rendered difficult, and so much the more unlikely is it that conception will occur. Moreover, in consequence of the stenosis, there is retention of the cervical mucus, which becomes thick and glutinous, and offers a further obstacle to the passage of the spermatozoa. The unfavourable influence upon the possibility of conception is, finally, increased if, as is often the case, in association with the stenosis, the cervix becomes elongated and assumes a conical form (these secondary changes probably resulting from the inflammatory states of the cervix common in cases of stenosis); and an additional obstacle is offered to conception by the association with the stenosis of flexion or version of the uterus. It is in such complicated cases that we so often have the associated symptoms of dysmenorrhoea and sterility; the dysmenorrhoea being due to the fact that the menstrual discharge, if abundant, is unable to flow away with sufficient rapidity through the greatly narrowed cervical canal; exuding from the vessels of the uterine mucous membrane more rapidly than it can be discharged, it accumulates in the uterine cavity, and gives rise to painful contractions of the uterus.

Precisely what degree of narrowing of the cervical canal it is which constitutes pathological stenosis, is in practice by no means easy to define; and only in regard to extreme cases of pathological constriction can there be no possibility of dispute. In cases of congenital stenosis of the cervical canal, the diagnosis is very easy, for the os uteri externum is then always extremely small; often the aperture is no larger than a small pin's head, a very fine probe can be passed through it with considerable difficulty and its passage is opposed all the way up to the internal os. But in cases of acquired stenosis of moderate severity, the diagnosis is often difficult. Owing to the small size of the

orifice, and to the distensibility of the soft parts by which it is surrounded, exact measurements are impossible. When the os is with difficulty detected by the skilled finger, when the sound is not readily introduced by the experienced hand, slipping past again and again, and inserted only after repeated efforts—such an os is, as *Olshausen* insists, always pathological. The normal virgin os uteri permits the easy passage of a thick uterine sound with a diameter of 3 to 4 millimeters ($\frac{3}{8}$ to $\frac{1}{2}$ in.); but there are cases in which, though a sound of this normal size can be passed, the os gives to the examining finger the sensation of being contracted. If, in such a case there is typical mechanical dysmenorrhoea with sterility, *Olshausen* considers that we are justified in assuming the existence of pathological stenosis of the os uteri, and in treating the case accordingly.

However, as *Kehrer* insists, it may be one of the greatest difficulties in diagnosis—a difficulty not always to be resolved even when all the attendant circumstances have received the fullest and most painstaking consideration—to determine whether in any individual case an anomaly of the cervix, such as stenosis of the external os or of the whole cervical canal, is or is not to be regarded as a cause of sterility. When stenosis is extreme, there need be no two opinions about the matter; the difficulty is in cases lying somewhere between a moderate degree of contraction and the lower physiological limit of smallness. Every experienced gynecologist will have seen such cases as *Kehrer* describes, in which before marriage the os appeared extremely small, and yet soon after marriage the woman became pregnant. For this reason we are justified, with *O. Johannsen*, in reverting rather to the functional than to the anatomical conception of stenosis, and in maintaining that so long as the cervical canal is sufficiently large to permit the uterine secretions to flow freely away, any stenosis that may exist is devoid of pathological significance. Only when the outlet for the uterine secretions is insufficient, so that the uterine cavity becomes distended (as manifested by an elongation of the canal in the supravaginal portion of the uterus, and by various disorders, amongst others chronic endometritis), is the stenosis with its consecutive dilatation of the uterus a serious obstacle to conception. “In such cases, the contractions of the uterus during coitus will not suffice to express the secretions it contains through the narrowed os, and the inevitable consequence of the incomplete evacuation of the uterus is that the aspiratory phase of the orgasm fails to occur.”

According to *Winckel*, stenosis of the external or of the internal os is a cause of sterility only in cases in which it arises from a follicular inflammation of the cervical mucous membrane; in such cases, the os, (internal or external, as the case may be), being

greatly narrowed by the numerous retention cysts, offers an obstruction to the evacuation of the glutinous secretion of the follicles yet remaining open. This secretion may offer an insuperable hindrance to the passage of the spermatozoa; but in the absence of catarrh of this character, a moderate degree of contraction of the cervical canal will not prevent the outflow of the menstrual discharge, or the upward passage of the spermatozoa.

The experience of horse and cattle breeders also shows the etiological importance of stenosis of the cervix in the production of sterility; and in the case of mares and cows who are unfruitful from this cause, artificial dilatation of the cervix has often been performed, with resulting restoration of fertility.

Swelling of the follicles of the mucous membrane of the cervical canal or of the cavity of the uterus, a condition which often results from cervical catarrh, will, equally with stenosis of the cervical canal, lead to sterility; pushing the mucous membrane before them, and becoming pedunculated, these swollen follicles ultimately enlarge to form polypi of the cervical canal or the uterine cavity, and may at times completely occlude the uterine canal. In Fig. 78 is depicted a polypus of this kind, which I removed from the cervix of a barren woman 30 years of age. On the apex of the polypus was a large ovulum Nabothi.

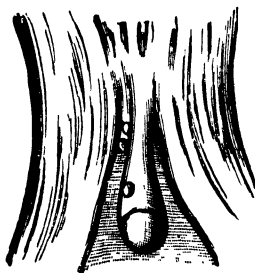


FIG. 78.—Cervical Polypus, originating from an Ovulum Nabothi.

Long-standing cervical catarrh readily leads to stenosis of the cervical canal, and consequently to sterility. The swelling and hypersecretion of the cervical mucous membrane the more readily hinders the entrance of the semen, inasmuch as the mucous folds on the anterior and posterior walls of the cervical canal which combine to form the *plicae palmatae* are in the normal state already sufficiently prominent; but in cases of catarrhal swelling they may project to such an extent as completely to occlude the canal. Stagnation of the thickened secretion offers in these cases a further hindrance

to the passage of the spermatozoa, a stagnation which becomes aggravated if in course of time the os becomes stenosed by overgrowth of scar tissue. Ultimately, also, in cases of chronic catarrh, a flexion of the enlarged and flabby corpus uteri readily occurs, and this imposes an additional difficulty in the way of conception.

It is for these reasons that those women who in girlhood have suffered from prolonged cervical catarrh, so often remain childless. The sequence of events is that already described: follicular catarrh, stagnation of secretions, stenosis of the cervical canal, enlargement and loss of tone of the uterus; the thin-walled, enlarged, and flaccid uterus ultimately gives way before the intra-abdominal pressure, bending back, usually, into the pouch of Douglas. Thus, retroflexion of the uterus is a common sequel of cervical catarrh (*Hildebrandt*). In some cases of sterility dependent upon cervical catarrh, this sequence of troubles has not occurred, and it is merely the mucus in the canal which prevents the passage of the spermatozoa. *B. Schultze* reports the case of a woman who had lived for 13 years in sterile wedlock, but became pregnant after a single removal of the cervical mucus.

The significance of chronic cervical catarrh in the causation of sterility explains how it is that in many cases of barren marriage the blame ultimately rests upon the husband, who, when he married, was suffering from "latent gonorrhoea," the inconspicuous relic of an acute attack, undergone, it may be, months and even years previously, and infected his wife with the disease. Such a gonorrhoeal catarrh is in women especially apt to assume a chronic form, and will then induce all the secondary morbid conditions previously described, and thus lead to sterility.

Gonorrhoea in women frequently results in sterility. In addition to the effect of cervical stenosis and of a morbid condition of the cervical mucus in preventing the upward passage of the spermatozoa, this disease may lead to many other changes inimical to fertility. Thus, gonorrhoeal infection in women often leads to inflammatory manifestations in the peritoneum, the perimetrium, and the parametrium, and to catarrhal changes in the Fallopian tubes (salpingitis, hydrosalpinx, pyosalpinx); these prevent the contact of spermatozoon and ovum, or cause pathological distortions of the walls or calibre of the tubes, which constitute permanent hindrances to the occurrence of conception. Young married women, whose husbands at the time of marriage were the subjects of incompletely cured gonorrhoea, and who shortly after marriage suffer from cervical catarrh, the discharge from the inflamed mucous membrane not infrequently having a suspicious greenish colour analogous to that seen in recent gonorrhoea in the male, often remain sterile for long periods, owing to this gonorrhoeal cervical catarrh, endome-

tritis, and tubal catarrh. For the diagnosis in such cases, in addition to noticing the virulent character of the inflammation of the vulva, urethra, and vagina, we must invoke the aid of the microscope; and it will often be possible to decide at once that the inflammation is gonorrhoeal by finding Neisser's diplococci enclosed within the pus cells of the cervical secretion.

The influence of "latent gonorrhoea" in diminishing the fertility of women has been especially asserted—and overestimated—by *Nöggerath*. From the fact that about 90% of sterile women are married to men who have suffered from gonorrhoea either before or during their married life, he infers that the sterility is due to latent gonorrhoea communicated from husband to wife. If this inference were justified, sterility would be far commoner than it actually is. *Nöggerath* makes use of the term "latent gonorrhoea" because the woman becomes infected without the obvious outbreak of any acute phase of the disorder. The disease remains latent, and a radical cure is not to be expected until the menopause. According to *Nöggerath*, there are four varieties of this disease: acute, recurrent, and chronic perimetritis, and oophoritis, always accompanied by catarrh of the mucous membrane of the genital organs.

Saenger, also, has asserted that 12% of all cases needing gynecological treatment are of gonorrhoeal origin; and he even considers that the consequences of gonorrhoea are in women more dangerous and destructive than those of syphilis. *E. Martin* has also maintained that endocervicitis leading to stenosis of the os uteri externum and of the cervical canal is, in the majority of sterile young wives, due to gonorrhoeal infection derived from a chronic, unhealed, but inconspicuous, gonorrhoea in the husband. He further considers it possible that various kinds of mechanical stimulation, for example, intra-vaginal onanism, may, in certain conditions, give rise to inflammation eventuating in cervical stenosis.

Of great interest are the mutual relations between dysmenorrhoea and sterility, a matter to which some allusion has already been made. A high degree of stenosis of the cervical canal is competent to produce both these symptoms; but dysmenorrhoea may arise from many other causes which have no direct influence in preventing conception.

Too much stress has, in fact, been laid upon the association of dysmenorrhoea with sterility, and I must therefore point out that I have seen numerous instances of dysmenorrhoea, including the so-called spasmodic form of the disease, in women who have given birth to many children; that objectively, in such cases, there was an absence of that rigidity of the cervix to which *Matthews*

Duncan attached so much importance; and, finally, that even when the dysmenorrhoeal pains had subjectively all the character of labour pains, the introduction of the sound could be effected without using any great force, and without giving rise to any severe pain.

Unquestionably, those authors, with *Sims* at their head, go too far, who regard dysmenorrhoea as a constant sign of stenosis of the cervical canal, and hence infer that in all cases in which sterility is associated with dysmenorrhoea, the sterility is due to such stenosis — an opinion contested by *Schultze* on the ground of anatomical investigations. Dysmenorrhoea gives no indisputable sign that the cervix is stenosed to such a degree as to hinder the occurrence of conception; and *Sims's* view, that in the great majority of cases dysmenorrhoea is due to mechanical obstruction, is not supported by experience. Women who suffer from severe dysmenorrhoea, frequently become pregnant, though later, it may be, than women in whom menstruation is normal and painless. Dysmenorrhoea is not due solely to contraction of the cervical canal, but also to a variety of other pathological conditions. The anomalies of the genital organs which give rise to dysmenorrhoea do not, for the most part, offer any obstacle to conception; and, on the other hand, stenosis of the cervical canal may exist in women who are entirely free from dysmenorrhoea.

In order to test *Sims's* theory of the mutual interdependence of dysmenorrhoea and sterility, *Kehrer* conducted an investigation into the state of menstruation both before and after marriage in relation to the fertility or infertility of the marriage. He ascertained that in sterile women virginal dysmenorrhoea had only been a very little commoner than in fruitful women. Hence, the changes in the reproductive organs upon which the occurrence of dysmenorrhoea depends, must not be regarded as necessarily constituting hindrances also to conception.

English gynecologists differ from those of Germany in believing that there is an intimate causal relation between dysmenorrhoea, and more especially spasmodic dysmenorrhoea, and sterility. The assumption is, that the contractions of the uterus, which by their violence during menstruation give rise to pains like those of labour, occur also during coitus; by these contractions, the entry of the semen into the uterus is prevented, or, if the semen does enter the uterus, it is speedily expelled. This spasmodic dysmenorrhoea has also been called mechanical or obstructive dysmenorrhoea, in order to call attention to the theory that the aim of the cramp-like contractions of the uterus is the expulsion of the menstrual blood which has accumulated in the uterine cavity; although *Duncan* himself is compelled to admit that neither the alleged mechanical obstruction,

nor the accumulation of menstrual blood, nor yet the dilatation of the uterine cavity, can actually be proved to occur.

NOTE.—The author is not quite correct in his contrast between "English" and "German" opinion in this matter. Most English gynecologists follow Matthews Duncan in calling attention to the fact that, as Herman puts it, "spasmodic dysmenorrhoea is often associated with sterility"; but almost all careful writers insist that while the association is proved, the nature of the causal connexion, if such exists, has not been elucidated. For instance, writing on this very question of the association of dysmenorrhoea with sterility, Hart and Barbour remark, "after a careful survey of the literature, we come to the conclusion that any discussion of sterility in which mechanical considerations have a prominent place, must be inadequate, and will always be bootless." It is true that Matthews Duncan writes (*Diseases of Women*, Lecture on Sterility), "The most generally recognized cause of sterility is spasmodic dysmenorrhoea"; but a careful perusal of the whole lecture will show that Duncan is saying more than he really means in using the word "cause," and that what he wishes to insist upon is the frequent and indisputable association of the two conditions. In the lecture on *Spasmodic Dysmenorrhoea* he writes, "Latterly it has been generally described as obstructive or mechanical dysmenorrhoea; these words 'obstructive' and 'mechanical' implying a theory of the disease which . . . I am sure is quite erroneous." Obviously, then, Kisch does injustice to Matthews Duncan when he writes that the latter is "compelled to admit" (*obgleich Duncan selbst zugeben muss*), what he was as a fact one of the first to maintain, in the face of considerable opposition!—*Transl.*

Duncan goes so far as to maintain that no actual or suspected local disturbance has such significance in connexion with the doctrine of sterility as spasmodic dysmenorrhoea. It possesses this significance owing to the probable connexion between the dysmenorrhoeic neurosis and the outflow of the semen, the deficiency of the sexual impulse and of sexual pleasure, and other disturbances of sexual excitement during coitus. With the relief of the dysmenorrhoea, we have, Duncan holds, made a long stride towards the cure

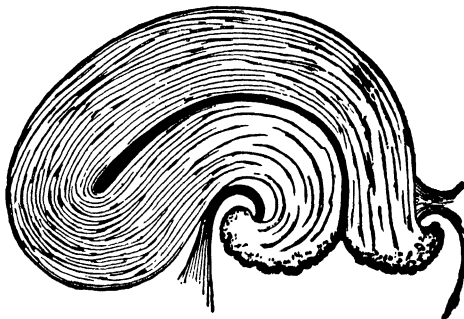


FIG. 79.—Ectropium in a Case of Bilateral Laceration of the Cervix. After A. Martin.

of the sterility. Among 332 married women who were absolutely sterile, Duncan found 159, nearly half of the total number, who were affected with spasmodic dysmenorrhoea.

Burton, in order to ascertain with certain beyond question whether stenosis of the external or internal os gives rise to dysmenorrhoeic troubles, examined six women during menstruation and at the time when they were experiencing the greatest pain; he found in no one of them any trace of narrowing of the canal. Owing to the congestion that occurs at this time, the uterus becomes erect, and any moderate flexion that may exist is temporarily straightened. In all the cases, the sound could be passed with extreme ease.

Ectropium of the lips of the cervix ("granular erosion") constitutes a hindrance to conception which is by no means rare; the condition is due to deep lateral lacerations of the cervix. The gaping of the cervical canal arising from such old-standing, often overlooked, cervical lacerations and from the parametric scars associated therewith, causes various irritative manifestations: blenorhoea, blennorrhagia, cystic degeneration of the mucous membrane, and these secondary conditions may be contributory causes of sterility; but lacerations of the cervix with ectropium interfere in a manner purely mechanical with the proper constitution of a receptaculum seminis and with the aspiration of the semen into the cervical canal. (Fig. 79.) In an earlier section of this work I laid stress on the fact that in the act of conception the musculature of the cervix had in a sense an active part to play; and the proper performance of this role is prevented by cervical lacerations. The cervical glands also suffer in cases of ectropium, and their function in facilitating the entrance of the spermatozoa into the uterine cavity is no longer properly performed. Finally, it is worthy of note that sexual gratification, the sensation of voluptuous pleasure during the sexual act, seems to be diminished in women with cervical lacerations, a fact noted especially by *Mundé* and *Ill*. The last-named found that in 34 women thus affected, sexual gratification was no longer experienced in intercourse; whilst in 27 of these cases, restoration of the integrity of the cervix by operation was followed by return of normal sexual feeling. In women who have given birth to one or two children, and then for a long time have remained barren, we not infrequently find deep cervical lacerations. *Breisky*, *Spiegelberg*, *Schultze*, and *Goodell* have operated in such cases, and shortly after the operation pregnancy has recurred.

Displacements of the Uterus.

With less justice than in the case of the pathological changes in the cervix above described, it is maintained that displacements of the uterus form a very frequent cause of mechanical hindrances to conception, and thus give rise to sterility.

It certainly cannot be denied that displacements of the uterus are found very commonly in sterile women; and, on the other hand,

among women with pathological flexion of the uterus, the percentage of the sterile is far higher than among women with a uterus normal in position and shape—but from these facts it would be erroneous to infer the general conclusion that displacements of the uterus offer a mechanical hindrance to conception. The casual connexion is less simple than this as a rule. In most cases in which displacements of the uterus are associated with sterility, there are additional pathological states of the uterus and its environment, relics of previous inflammation in the uterus, the uterine annexa, or the parametrium, or displacements of the uterine annexa; these changes may be either the cause or the result of the existing displacement of the uterus, and it is upon them, and not primarily upon the displacement, that the sterility depends. The accuracy of this view is proved by the experience, by no means an uncommon one, that in such cases, when the actual cause of the sterility is removed, the woman will become pregnant, although the displacement of the uterus persists.

How difficult it is, in a particular case, to determine whether the pathological ante flexion is the true obstacle to conception, or the antecedent parametritis posterior and the concomitant metritis and endometritis! How can we decide whether a retroflexion is the simple mechanical cause of sterility, or whether the latter condition does not rather depend upon complicating perimetritis and oophoritis?

On the other hand, we must not fly to the other extreme, and absolutely deny that a displacement of the uterus can be the mechanical cause of sterility. We meet with cases in which we are forced to assume that the flexion interferes both with the outflow of the menstrual blood and with the ingress of the seminal fluid. And this is true, not merely of flexion to an acute angle, often associated with infantile dimensions of the cervical canal or of the external or internal os, but also of those advanced degrees of flexion in which, doubtless in part also from the accompanying catarrh, complete stenosis of the os uteri externum has resulted. The combination of displacement of the uterus with stenosis of the cervix, is in these cases the essential hindrance to conception. When the os is reasonably large, a moderate flexion of the uterus forwards, backwards, or to one side or the other, will not often prevent conception, for the action of the muscular bands in the various ligaments of the uterus will retain the os in a sufficiently favourable position. But if a contracted os is associated with flexion, sterility is very likely; and almost inevitable, if fixation of the flexed uterus has occurred from inflammatory exudation and fibrosis in one of the broad ligaments.

That the belief that displacements of the uterus constitute an obstacle to conception is a widely diffused one, is shown by the fact

that among certain nations a means employed for the prevention of pregnancy is the artificial production of displacements of the uterus.

Of the displacements of the uterus, the versions, anteversion, retroversion, and lateral version, have a more pronounced influence in hindering conception than the flexions; for, in the case of version of the uterus, the uterus moves as a whole round a horizontal axis, so that when the fundus moves in one direction, the portio vaginalis moves in the opposite. When the neck of the uterus is thus displaced, the tip of the glans penis fails during coitus to come into contact with the os uteri externum, as it normally should do, and passes into a vaginal cul-de-sac, in retroversion, the posterior fornix, in anteversion, the anterior fornix, and in lateral version the lateral fornix of the side opposite to that towards which the cervix uteri is directed. In high degrees of this malposition, the vaginal fornix covers up the os externum as with a valve. (*Beigel*.)

Von Scanzoni has especially insisted upon the frequency with which sterility results from chronic metritis complicated with anteversion. In 59 sterile women affected with chronic metritis, he found in 34 instances more or less pronounced anteversion, and hence was led to infer that this particular combination of disorders plays a great part in the production of sterility.

Especially frequent is sterility in cases of anteversion of the uterus, if in addition there is some contraction, even though moderate in degree, of the os uteri externum; this combination of disorders is one extremely unfavourable to the entrance of the spermatozoa into the uterus.

Flexion of the uterus offers less hindrance than version to the entrance of the spermatozoa, for the reason that in the former condition the relations between the vaginal portion and the glans penis during coitus are not affected. But when the flexion is extreme in degree, the cervical or uterine canal may at some point become absolutely impassable for the spermatozoa; and further, extreme flexion is apt to lead to the occurrence of parametritis and perimetritis. But, generally speaking, flexions of the uterus are far less often the cause of sterility, than was formerly supposed. It used to be believed that flexion of the uterus was followed by stenosis of the os uteri externum, by which the outflow of the menstrual blood and the ingress of the semen were equally prevented. It is true that infantile acute-angled flexion of the uterus is often associated with infantile stenosis of the cervical canal or of the internal or external os; and it is also true that extreme degrees of flexion associated with uterine catarrh; favour the occurrence of stenosis and obliteration of the external os; but *B. Schultze* rightly insists that in most of the cases in which a diagnosis is made of stenosis of the uterine canal associated with a flexion of the sexually mature uterus, the supposed

"stenosis" merely represents the difficulty which has been experienced in passing the customary rigid uterine sound past the angle in the uterine canal. Still, the fact remains, that among women with uterine flexion there is a larger percentage of sterile individuals than among women whose uterus is normal.

As regards antelexion of the uterus, either the congenital, uncomplicated antelexion of the uterus, due to developmental anomaly, or the acquired form, due either to subinvolution of the uterus during the puerperium, or to parametric or perimetritic processes,—may offer mechanical obstacles to conception, and thus give rise to sterility; sterility with antelexion occurs especially in cases in which the antelexion is dependent upon parametritis posterior, associated with metritis and endometritis, or when any other complication is present to make the flexion a severe one. In some sterile women, we find antelexion associated with supravaginal elongation of the portio, and in such cases both states would appear to result from catarrh of the uterine mucosa. How frequent is the combination of ante-



FIG. 80.—Antelexio Uteri. After A. Martin.

flexion of the uterus with sterility, is shown by the figures published by *Sims*, who in 250 cases of congenital sterility found 103 cases of anteversion, and in 255 cases of acquired sterility found 61 cases of anteversion.

Fritsch writes in the following terms regarding the difficulty with which impregnation is effected in women suffering from ante flexion of the uterus: "In cases of ante flexion of the uterus, the vagina is remarkably long, the portio vaginalis often badly formed; the ejaculated semen flows away rapidly from the contracted vagina, without, perhaps, ever coming into contact with the portio vaginalis." He states it as a fact that women with anteversion conceive less readily than those with retroversion of the uterus (when this latter is moderate in degree); for in slighter degrees of retroversion, the axis of the uterus is a continuation of the axis of the vagina, so that the orifice of the male urethra and the os uteri externum will be in contact during intercourse — more especially because in such cases, owing to the portio vaginalis being low in the pelvis, the vagina is short; in cases of anteversion, on the other hand, the cervix is high up, and the vagina is long and narrow. *Fritsch* considers that generally speaking the fact that the internal or the external os is small is of little importance; but the serious factors, those leading to sterility in cases of anteversion — apart from all other considerations — are the unfavourable high position of the portio vaginalis, the occlusion of the os by the close application of the posterior vaginal wall, and the presence of glutinous mucus in the cervical canal. Since in cases of ante flexion we very commonly find hypersecretion of the uterine mucous membrane, whilst, owing to the narrowing of the external os, the mucus is unable to flow freely away, but accumulates and becomes inspissated, we have the uterine mucous membrane covered with a tenacious coating, which may perhaps render the implantation of the ovum a very difficult matter, even though the upward passage of the spermatozoa be still possible. The clinical association of pain produced by drawing forward the portio vaginalis, with marked ante flexion of the uterus, dysmenorrhoea, and sterility, is a strikingly common one.

Schröder points out that, although sterility is common in cases of ante flexion, cases are yet seen in which, notwithstanding the existence of extreme ante flexion, conception occurs very speedily after marriage. The fact that in cases of ante flexion we have difficulty, not impossibility, of conception, explains how it is that of two women suffering from ante flexion of the same severity, one will readily become pregnant, whilst the other remains permanently barren.

Retroversion and retro flexion offer obstacles to conception chiefly in cases in which this displacement is a congenital anomaly, or when it has developed immediately after puberty; or when complications exist, especially when the retro flexed uterus is fixed by exudation. In nulliparae, these deviations backwards will not rarely be found to be the cause of the sterility. Much less often does sterility ensue

when retroversion or retroflexion occurs in women who have already given birth to several children, i. e., when the displacement is a puerperal disorder; the reason why such cases are not often sterile, is to be found in the fact that the wide cervical canal favours the passage of the spermatozoa, and the softness of the tissues prevents any serious obstacle to their upward progress being offered at the angle of flexion; on the other hand, severe retroflexion in a woman who has not yet borne a child offers a serious hindrance to conception, on account of the smallness of the cervical canal, and the sharp flexion of the more rigid uterus.

In general, then, retroflexion can be regarded as offering but a slight hindrance to conception. In fact, many women with retroflexion become pregnant again and again, and may abort several times in a single year. When in parous women suffering from retroflexion, sterility ultimately occurs, *B. Schultze* considers that it is



FIG. 81.—Retroflexio Uteri. After A. Martin.

not the retroflexion which is primarily to blame, but rather the secondary consequences so common in this disorder: uterine catarrh; the general constitutional debility due to such catarrh, and to the accompanying menorrhagia; perimetritis, and oophoritis.

Retroflexion and retroversion of the uterus occur chiefly in women who have previously given birth to children; the bend is commonly

obtuse or right-angled, and above the upper end of the cervical canal; sterility in such cases, usually acquired, has a favourable prospect of cure. As *Kehrer* points out, sterility appears to be constant only in cases of retroflexion in which the uterus is fixed; the reason probably is that by the backward inflexion of the uterus the abdominal orifice of the Fallopian tube is dragged away from the ovary, and thus the ovum, when it is discharged from the follicle, fails to find its way into the tube.

Among 57 cases of retroflexion of the gravid uterus, *E. Martin* found that in 6 the patient was pregnant for the first time, from which it may be inferred that the anomaly existed prior to the occurrence of conception.

That in some cases of sterility it is the retroflexion of the uterus that is to blame, is shown very clearly *ex juvantibus*, inasmuch as reposition of the uterus and maintenance of the organ in its proper position relieves sterility perhaps of long standing, together with all the other troubles secondary to the displacement of the uterus. As an example, I quote one case from among several of the kind of which I have notes. Mrs. N., 25 years of age, married 6 years, childless, suffers from severe dyspeptic troubles, leading to emaciation and profound depression. She has been treated fruitlessly for gastric catarrh, but has not previously been subjected to gynecological examination. I insisted on making such an examination, and found the uterus somewhat enlarged and completely retroflexed. The successful replacement of the organ was followed by the cessation of the previously constant vomiting after meals, and by the disappearance of the other dyspeptic troubles; shortly afterwards the lady became pregnant, and pregnancy ran a normal course. Since then, she has had three children; there has been no recurrence of the dyspepsia.

According to *Sims*, retroversion of the uterus is frequently associated with sterility. Among 250 married women who had never been pregnant, we found no less than 68 cases of retroversion; among 255 women who had had one or more children, but had then ceased to be fruitful, he found 111 cases of retroversion; and in some of these cases the retroversion was uncomplicated. *Grenser* and *Vedeler* also found retroflexion to be a common cause of sterility; the last-named, examining 7 nulliparous married women, found retroversion in 5; in these cases, however, there was associated disease of the uterus or of its environment.

Inversion of the uterus, even in the minor degrees of the affection, in which coitus is still possible, almost invariably causes sterility, owing to the occlusion of the uterine orifices of the Fallopian tubes. Moreover, in inversion of the uterus, the position assumed by the os uteri externum is such as to render the entrance of the semen

almost impossible. Finally, when the uterus is inverted, the mucous membrane undergoes changes which render it unfit for the implantation of the ovum; the researches of *P. Ruge* show that it is thinned and that the epithelium is cast off and replaced by granulation tissue. In cases in which the inverted uterus has long projected through the genital fissure, its surface becomes covered by a multilaminar pavement epithelium; at the same time, the glandular apparatus undergoes atrophy, only the fundi of the glands being preserved, and the muscular substance is hypertrophied. None the less, in exceptional cases, which have been reported by *Emmet*, *Macdonald*, and *Tyler-Smith*, pregnancy has occurred after long-enduring inversion of the uterus. *Lauenstein* had a patient in whom an inverted uterus was replaced after a year and a half; the following week she became pregnant. *Stevens* saw a case in which the woman became pregnant six months after the reduction of an inversion of the uterus of nine months' standing.

Prolapse of the uterus is seldom the cause of sterility, inasmuch as during coitus replacement of the organ is effected. It may even be said that in cases of prolapse, the low position of the uterus and the enlargement of the os uteri externum, favour the direct ejaculation of the semen into the cervical canal (likewise enlarged), and that thus the conditions are advantageous for impregnation. In fact, conception more commonly occurs in cases of prolapse than might have been anticipated in view of the various consecutive disorders apt to complicate this affection—chronic metritis and endometritis, erosion, hypertrophy of the cervix, displacement and laceration of the annexa, etc. The extent to which the capacity for conception is unfavourably affected in cases of prolapse of the uterus, is proportional to the amount of descent undergone by the uterus, for the nearer the os approximates to the vaginal orifice, the farther removed from the os will be the point at which the semen is ejaculated. In cases of complete prolapsus it has happened that coitus has been effected directly through the everted os uteri, and has resulted in conception; a case of this kind is reported by *Hervey*.

Unbiased gynecological experience in no way supports the views of *Sims* and *Hewitt* regarding the frequency with which displacements of the uterus constitute mechanical causes of sterility. *Sims* supports his views with the figures previously quoted, from which the following table is compiled:

	No. of cases.	Ante- version.	Retro- version.	Total cases of displace- ment.
First class	250	103	68	171
Second class	255	61	111	172
Totals	<u>505</u>	<u>164</u>	<u>179</u>	<u>343</u>

From this it appears that in the 1st class, among 250 married women who had never given birth to a child, there were 103 cases of anteversion, and 68 cases of retroversion; whilst in the 2nd class, among 255 women, who had had children, but for one reason or another had become unfruitful earlier than the natural age for this occurrence, there were 61 cases of anteversion, and 111 cases of retroversion.

The general result of these figures is to show that two-thirds of all sterile women, without regard to the especial cause of the displacement, suffer from one form or the other of uterine displacement, and that the relative frequency of anteversions and retroversions is reversed in the two classes, the nulliparous married women, and the married women previous parous but latterly become sterile, respectively.

Hewitt similarly regards malpositions of the uterus as frequent causes of sterility. He analysed 296 cases of flexion and version of the uterus treated by him at University College Hospital during the years 1865 to 1869, partly in the wards, and partly in the out-patient department. Of these 296 women, 235 were married; 100 were cases of retroflexion, and 135 were cases of anteversion. Of the 235, 81 had had no full-term children, 57 of the 81 having never been pregnant, and the remaining 24 having had miscarriages only. Of the remaining 154, married and parous women, a large proportion were sterile at the time when they applied for treatment; though in the years immediately after marriage they had given birth to one or more children, they had subsequently ceased to be fruitful.

All that these figures prove to an unbiassed judgment is, however, that displacements of the uterus are apt to render conception difficult; or that, in addition to other pathological states of the pelvic organs, they are frequently met with in sterile women — but in and by themselves, displacements of the uterus do not offer any very serious or very frequently occurring obstacle to conception.

That conception is possible in spite of the very notable mechanical hindrances which certain displacements of the uterus may offer to the occurrence of pregnancy, is shown by many striking examples in gynecological literature. *Winckel*, *Olshausen*, and *Holst* have all seen pregnancy occur in women who at the time of conception were wearing intra-uterine pessaries; and *von Scanzoni* has published cases in which fertilization took place, notwithstanding extreme anteversion which stenosis of the os uteri, and in another instance, notwithstanding the presence of a polypus filling the external os.

Myoma of the Uterus.

Among the mechanical obstacles to conception which act by preventing or rendering difficult the contact of spermatozoon and

ovum, must be enumerated uterine myomata, and these must therefore be included among the causes of sterility.

According to their number, their size and their situation, uterine myomata give rise to different and manifold mechanical disturbances. When there are numerous intra-mural myomata, even when these are of a moderate size, the uterine cavity becomes bent and narrowed, and retention of the secretions may ensue, often lasting for a lengthy period. Submucous fibromyomata, when situated low down, near the internal os, may occlude this orifice completely; when implanted higher up in the uterine cavity, they are apt to cause flexion of the uterus; large, pedunculated fibromyomata of the uterus may descend into the vagina and narrow this passage.

Myomata interfere with conception in very various ways. Mechanically, they may occlude the uterine orifices of the Fallopian tubes, or may give rise to displacement of either tubes or ovaries, or, again, by blocking the uterine cavity, they may hinder the descent of the ovum and the upward passage of the spermatozoa; their presence may cause catarrhal disease of the uterine mucous membrane, or give rise to profuse hemorrhage, and either of these secondary changes may interfere with the implantation of the ovum; and there is yet another way in which myomata may interfere with conception, and give rise to sterility—this is a subject to which especial attention has been given by *Winckel*, and to which we may here most conveniently allude. The continued growth of small submucous myomata often gives rise to a hyperaesthetic state of the genital organs analogous to vaginismus, and this interferes with coitus. Large myomata, on the other hand, give rise to catarrhal states of the uterine cavity and to hyperplasia of the mucous membrane, constituting hindrances alike to conception, and to the implantation and further development of the embryo if fertilization should be effected; moreover, the growth of large myomata often causes perimetritis, perisalpingitis, and perioophoritis, and these, partly by abnormal fixation of the uterus, and partly by closing up the tubes and so thickening the tunics of the ovary as to prevent the rupture of the graafian follicles, give rise to sterility.

The existing statistics regarding the relation of the growth of myomata of the uterus to fertility, incomplete as they are and lacking in exactitude, suffice nevertheless to show that the fruitfulness of women suffering from uterine myomata is notably diminished by the growth of these tumours; more particularly, we learn that whilst the number of women with uterine myomata who have one child is sufficiently large, the number of multiparae thus affected falls greatly below the average of fertility. A characteristic feature of the influence of myomata in producing sterility is clearly shown by the statistics, inasmuch as pregnancy is comparatively

common in the case of women with subserous myomata, in whom the uterine cavity and mucous membrane are as a rule least affected, whilst fertility is far more seriously impaired in the case of women with submucous myomata.

West, in the case of 43 married women with myomata of the uterus, found 7 childless; the remaining 36 had in all given birth to only 61 children, and 20 of these had only one child each. Of *Beigel's* patients, 86 married women with uterine myomata, 21 were sterile; of *McClintock's* 21 patients similarly situated, 10 were sterile. *Von Scanzoni's* investigation showed 38 sterile women among 60 married women suffering from myoma uteri; *Michel*, 26 sterile among 127; *Winckel*, 134 sterile among 415. From a table showing the number of children born to each of 108 women with myoma uteri of whom 46 were observed by *Winckel*, and 62 were in *Süsserott's* collection, it appears that on an average 2.7 children were born to each woman thus affected, whereas in Saxony the average number of children born to each married woman is 4.5.

Many other gynecologists have published statistics regarding this matter, *Gusserow*, *Röhrig*, *Schröder*, *E. von Flamerdinghe*, and others, some of them dealing with a very large number of cases, and all show that 30% and upwards of married women with uterine myomata remain sterile.

On the other hand, *Hofmeier* maintains, in opposition to the prevailing view, that in the great majority of cases myomata are not to be regarded as giving rise to sterility. His investigation embraced 313 persons, of whom 25% were unmarried, and 75% married, and of these latter, 25 to 30% were sterile. (It must be pointed out that compared with the average percentage of sterile marriages — about 10%, this figure of 25 to 30% is a very high one.) From a comparison of the age of the sterile married woman with the duration of married life in each case, *Hofmeier* is led to believe that it is not the myomata which have exercised an influence unfavourable to fertility, and that the occurrence of sterility in these cases is referable to other causes. The origination of myomata he regards as etiologically independent of the exercise or non-exercise of the sexual act. The apparently overwhelming preponderance of the occurrence of myomata in unmarried and in sterile married women is, he thinks, to be explained by the fact that unmarried women and nulliparous married women seldom have occasion to consult a gynecologist, but that the one condition that renders it necessary for them to do so is the growth of a uterine myoma. Generally speaking, pregnancy seldom occurs after the age of 35 years, precisely the age at which the growth of uterine myomata begins to be common. If, however, at this comparatively late age pregnancy does occur, it is so often found to be complicated

by the presence of a uterine myoma, that *Hofmeier* is even led to infer that the presence of such a tumour must have a certain favouring influence upon the occurrence of conception; the facilitation of conception in these cases he explains by the fact that the growth of the tumour renders the blood supply of the whole reproductive apparatus more active than is normally the case, and protracts the duration of ovarian activity.

Diseases of the Vagina and the Vulva.

Various pathological states of the vagina and vulva may cause incapacity for fertilization by rendering copulation impossible. Such states may be either congenital or acquired.

In rare cases the hindrance consists in abnormal smallness of the vulva, but this condition is usually associated with other defects in development of the reproductive organs, which combine to give rise to sterility. Congenital adhesion of the labia minora and majora is sometimes met with, with or without atresia of the urethral orifice, the connexion between the labia may be superficial and epithelial merely, as in a case recorded by *Ziemssen*; or the labia may be firmly united throughout their whole thickness. Much less common is acquired adhesion of the labia, causing atresia vulvae, and rendering coitus difficult or entirely impossible. Various other abnormalities of the reproductive organs which may give rise to sterility have already been described in the section on the pathology of cohabitation, these are: abnormalities of the hymen; anomalous formation and hypertrophy of the labia; excessive size of the clitoris; anomalies of the vagina, its absence, stenosis, atresia, duplication, and abnormal termination.

More detailed mention must, however, be made here of vesico-vaginal fistula as leading to sterility. Such a fistula is rightly regarded as one of the conditions preventing conception, but it does not render the occurrence of pregnancy absolutely impossible. It will readily be understood that the unpleasant symptoms commonly met with in these cases, will be apt to deprive both husband and wife of inclination toward sexual intercourse; again, apart from this psychical influence, the functions of the female reproductive apparatus are commonly disturbed to a very serious degree by the existence of a vesico-vaginal fistula; and, finally, the unfavourable influence of the urine on the semen must also be taken into consideration, for, as an acid fluid, the urine will notably check the activity of the movements of the spermatozoa — still, notwithstanding all these unfavourable influences, conception will sometimes nevertheless occur in such cases. But of those who acquire a vesico-vaginal fistula as the result of a difficult labour, a very small proportion only will again become pregnant.

Freund draws attention to *Simon's* experiences, reminding us that the latter, in his cases in which women with vesico-vaginal fistula become pregnant, invariably saw the pregnancy terminate in abortion or premature labour; but still, *Freund* quotes also a case of *Schmitt's*, and mentions another of his own, showing that this premature termination of the pregnancy is not absolutely inevitable in such circumstances. *Schröder*, indeed, goes far in the opposite direction, and writes: "Such women not rarely become pregnant, and their pregnancy usually runs a normal course." *Kroner* made a statistical investigation of the question, and found that of 60 women suffering from vesico-vaginal fistula, 6 became pregnant during the persistence of the fistula. *Winckel* reports a remarkable case in which, after the ordinary means of curing the fistula had been vainly tried, transverse obliteration of the vagina was undertaken; the operation was not completely successful, as a small passage remained patent; the patient returned home for a time, and became pregnant, the spermatozoa having found their way through this passage. *Simon* reports another noteworthy case, that of a woman 57 years of age, with a vesico-vaginal fistula close to the external os; during the 26 years the fistula had lasted she had complained of cessatio mensium; when the fistula was closed by operation, she again began to menstruate.

Sometimes we meet with abnormalities of the vagina—not strictly speaking morbid states—which, though they may not at first sight appear to be of much significance, yet suffice to render conception difficult, or even impossible. One of these conditions is extreme shortness of the vagina, leading to the formation of a "poche copulatrice" (Courty), in which during coitus the semen is ejaculated at a distance from the os uteri externum; another is excessive length and width of the vagina; another, some displacement of the vagina which diminishes the prospect that the semen will enter the cervical canal. Such vaginal false passages, "fausses routes vaginales," have been described more especially by *Pajot* as causes of sterility.

Another cause of sterility is the rapid outflow of the semen after coitus, either in consequence of dyspareunia, or on account of some abnormality in the configuration of the vagina, or, finally, owing to deficient action of the constrictor cunni (or bulbocavernosus muscle) and the muscles of the pelvic diaphragm. In cases of profluvium seminis, the woman herself will often call the physician's attention to the defect.

Many cases of sterility depend upon a cause the recognition of which in this connexion is comparatively recent, namely, the hermaphroditism of the person concerned. Witness the following case described by *Dohrn*: The individual had been baptised and brought

up as a girl. At the age of twenty years she began to suffer from a distressing sensation of pressure, recurring at intervals of four weeks. A local examination was made by a physician, who assured the mother that "there was no hindrance to menstruation, but that when she married an incision would become necessary." After a time she became engaged and was married; and shortly afterwards her husband demanded a renewed gynecological examination. This was undertaken by *Dohrn*, who declared that the supposed girl was of the male sex. The external reproductive organs had the feminine form. The labia majora were large and well-formed; in the anterior extremity of each labium was a rounded, sensitive, soft body, of the size of a large bean, which was capable of being drawn forwards towards the abdomen; the labia were beset with muscular fibres; the clitoris was 4 cm. (1.6 in.) in length, resembling an imperforate infantile penis, it was slightly erectile; in the vestibule there were two openings, the anterior of which was the urethra, the posterior led into a blind passage 2 cm. (0.8 in.) in length, representing the fused lower extremities of the ducts of *Müller*; per rectum no trace could be found of vagina, uterus, or ovaries, but also no trace of prostate. The marriage, in which this individual declared himself to be happy, was annulled. *Leopold* observed a similar case, in which the individual had lived as a wife for the space of 25 years. Another striking case is recorded by *Steglehner*. As *Zweifel* remarks, to decide the true sex of such individuals is often extremely difficult. "At the present day, indeed," he continues, "it is no longer the fate of those who from no fault of their own have had imposed on them the name and upbringing of another sex than that which is truly theirs, and who have thus been led to contract marriage with one who in reality is of their own sex, to be treated with the horrible injustice which was meted out to them in the middle ages, when, as we learn from contemporary writers, they were haled before the bar of "ecclesiastical justice," charged with profaning the sacrament of marriage, and threatened with death at the stake—but even now a mistake in the decision of an infant's sex entails in later life a thousand distresses and inconveniences."

Recently, *Neugebauer* has made as complete a collection as possible of all the recorded cases of hermaphroditism.

Secretions of the Genital Organs.

The constitution of the secretion of the vaginal mucous membrane, or of the secretion formed in the cervical canal, or both of these in combination, may constitute hindrances to the normal contact of spermatozoon and ovum.

The secretions of the female genital organs are manifold. The outer surface of the labia majora is covered with skin, containing sebaceous and sweat glands; but the inner surface of the labia majora and the rest of the external genital organs are covered with mucous membrane, the outer stratum of which consists of stratified pavement epithelium; this epithelium contains sebaceous glands and mucus glands. The intermixture of the secretions of these glands with the epithelial scales which are constantly being cast off in large numbers, constitutes the whitish material with which this region is smeared, known as "smegma." A mucus secretion of a fluid consistency is discharged from the vulvo-vaginal glands known by the name of Bartholin's glands.

The mucous lining of the vagina is poor in glands; it contains very numerous papillae, which do not, however, project from the surface of the membrane, since the depressions between the papillae are filled in by the stratified epithelium with which the entire extent of the vaginal mucous membrane is covered. The secretion of the vaginal mucous membrane is a fluid of thin consistency with an acid reaction; the admixture of numerous morphological elements, in the form of epithelial cells cast off from the superficial layers of the stratified epithelium, often, however, makes the vaginal secretion thick and opaque. The epithelial lamellae are frequently covered with heaps of lepthothrix granules, and among the granules are seen vibrones and bacteria and also numerous lepthothrix threads of varying length.

The same stratified epithelium extends on to the neck of the uterus to a distance which varies in different individuals; gradually, however, the number of layers diminishes, the flattened cells give place to thicker, prismatic cells, until we have a single-layered prismatic epithelium; finally the cells become columnar and ciliated, and this columnar ciliated epithelium covers the whole of the interior of the uterus. The mucous lining of the cervical canal contains numerous mucous glands, some of which are simple tubular glands, whilst others are racemose; they are lined with columnar ciliated epithelium, and secrete a dense, gelatinous, alkaline mucus, containing a few epithelial cells and occasional leucocytes. The mucous membrane of the uterine cavity is beset with simple tubular glands, lined with a single layer of prismatic epithelium; these glands secrete a grayish alkaline fluid. The secretion formed in the uterine cavity is thinner in consistency than that formed in the cervical canal.

Normally, the secretion of the vaginal mucous membrane is not more than is sufficient to keep the surface of the canal moist and slippery; it is a thin fluid of an acid reaction, and almost as clear as water. Shortly before and after menstruation, the secretion of

the vaginal mucous membrane becomes more abundant; it is even thinner than at other times; the reaction remains acid. The secretion of the cervical canal is normally, in the absence of sexual intercourse, small in amount, so that a free flow of secretion from the os uteri externum is by itself sufficient to indicate that the mucous membrane of the canal is in an abnormal condition. The vitreous, gelatinous, alkaline mucus secreted by the glands of the cervical canal is normally retained within the canal, and is seen on examination with the speculum to fill the os uteri externum. In consequence of the congestion of the uterus that occurs during menstruation, and for the same reason during sexual excitement, the secretion of the cervical canal is more abundant, it also becomes less tenacious, and flows out through the os into the vagina. But this evacuation of the cervical secretion through the os is a normal occurrence only during menstruation and as a result of sexual intercourse; in these circumstances it appears in the form of a clear or somewhat yellowish drop of fluid exuding through the os uteri externum.

In catarrhal states, the secretions of the genital passage, like those of other mucous membranes, become abnormal. There is an increase in the number both of epithelial elements and of leucocytes; and in very acute catarrhs, erythrocytes also mingle with the secretion. On microscopical examination we find that the catarrhal secretion differs in its characters according to the part from which it is derived: the mucus from the cervical canal forms gelatinous accumulations; that from the vaginal mucous membrane forms thick opaque masses; and in the mixed secretion which exudes from the vulva, we find also smegma from the external genital organs. In addition to cells from the laminated epithelium, we see often young cells, somewhat oval or polyhedral in form, with granular protoplasm, and a vesicular nucleus. In some inflammatory states, pus corpuscles will also make their appearance. Various micro-organisms are in addition to be found in the catarrhal secretions.

The reaction of the vaginal secretion is normally faintly acid; should it become strongly acid, the movements of the spermatozoa are immediately suspended. The mucus of the cervical canal, the alkaline reaction of which is extremely favourable to the onward movement of the spermatozoa, may, owing to catarrhal processes, be so altered that it becomes acid; it then destroys the spermatozoa, and gives rise to sterility. This fact can sometimes be proved by microscopical examination. In several cases in which endometritis existed in sterile women I made a microscopical examination of the cervical mucus shortly after the completion of sexual intercourse; and in a number of these, no living spermatozoa were to be seen, but only dead, motionless spermatozoa (Fig. 82). I had, of course,

in these cases, previously assured myself that the husband's semen was normally active.



FIG. 82.

Mucus from the Cervical Canal, taken one hour after sexual intercourse, from a woman suffering from chronic endometritis.

Among the epithelial cells, pus cells, and finely granular masses, we see a few motionless, dead spermatozoa.

According to *Nöggerath*, in cases of uterine catarrh, we may find one of three different varieties of secretion. In some cases it is small in amount, and very thin in consistency; in others, it is moderate in amount, very thick, non-transparent, bright yellow, and gelatinous in consistency; in the third class of cases, we have numerous degrees of variation, starting from the normal, purely mucus, transparent secretion, mixed with yellow flocculae, up to a secretion which has almost the aspect of pure pus. The first described variety is, according to *Nöggerath*, met with chiefly in women whose uteri are small, with indurated tissues, and its discharge seems to depend upon commencing atrophy of the mucous membrane. The second form is the most obstinate, the catarrh being situated chiefly in the cervical and probably also the uterine glands; whereas the first variety of secretion is rather a serous transudation, and contains very few formed elements. The third form is characterized by extensive denudation of the superficial epithelium, and is mixed with a smaller or larger quantity of pus.

Levy, who made microscopical examinations in sterile women (39 cases), gives it as a "constant fact" that when the cervical secretion contains epithelial and pus cells in large quantities, the spermatozoa never retain for long their power of movement. Whereas in examinations made repeatedly on healthy women 25 hours after sexual intercourse, he found numerous spermatozoa

still in active movement, in women having a catarrhal discharge with the characters just mentioned, five hours after intercourse the movements of the spermatozoa had almost entirely ceased.

Not only may the secretions of the genital passage be injurious to the spermatozoa by their quality, but further a very abundant secretion may interfere with fertilization. In the first place a very abundant secretion is apt to be very dilute, and if the spermatozoa are immersed in a fluid of which the specific gravity is too low, they swell up from imbibition of water, and their movements are suspended. But excessive secretion, such as is sometimes met with in cases of cervical catarrh, may also have a purely mechanical deleterious action, by washing away the semen out of the vagina. If, again, the quantity of the ejaculated semen is unusually small, contact with the normally acid vaginal mucus may suffice to render the spermatozoa speedily motionless. Finally, when the cervical secretion is of a too tenacious consistency, so that it fills the os as with a plug, the upward passage of the spermatozoa may be barred.

Such tenacious cervical mucus will give rise to sterility especially in women who have not previously born children; whereas in parous women, owing to the more patulous condition of the os, the entrance of the spermatozoa is not so effectually prevented. The same distinction between nulliparous and parous women must be made, as *von Scanzoni* has pointed out, also as regards the production of sterility by hypersecretion of uterine mucus. Women who become affected with uterine blenorhoea only after having had one or more children, will readily become pregnant again; but when such blenorhoea affects a woman who has never been pregnant, sterility almost invariably results.

Von Grünewaldt has drawn attention to a somewhat rare form of chronic endometritis with tenacious secretion, leading to sterility. The shape, size, and consistency of the uterus appear normal, the organ is often virginal, but with the speculum we see exuding from the os a greyish green, extremely tenacious secretion, which is wiped away with difficulty. He saw 24 women affected with this disease; 10 of these had lived in marital intercourse for many years without ever having become pregnant; in 10 others there was acquired sterility, i. e., they had at first borne children after marriage, but had subsequently ceased to be fruitful; in the remaining 4 it was not possible to ascertain whether they were fruitful or sterile, since two of them were living apart from their husbands, whilst in the case of the other two only two years had elapsed since the birth of the last child. In any case, not one of the women thus affected had ever become pregnant subsequent to the time at which she acquired this form of endometritis, notwithstanding the fact that in several of the cases the symptoms were alleviated by treatment.

We must here consider also the effect of gonorrhoeal infection in giving rise to sterility in women. Sterility may arise from gonorrhoea in women in various ways. Sometimes the abundance of the cervical secretion is alone sufficient to prevent the entrance of the spermatozoa into the uterus; in other cases the hindrance to fertility depends upon the inflammatory conditions in the pelvis that so frequently result from gonorrhoeal infection—perimetritis and parametritis; it may be catarrhal changes in the tubes—salpingitis, hydrosalpinx, and pyosalpinx—by which the contact between spermatozoon and ovum is prevented. Chronic gonorrhoeal endometritis may give rise to such changes in the uterine mucous membrane as to unfit it permanently for the implantation of the ovum, even should there be no obstacle to fertilization. Finally, double gonorrhoeal oophoritis may result in rendering the formation of mature ovum an entire impossibility—bringing about a condition analogous to azoospermia in the male, and causing absolute sterility. Although in many cases the detection of the gonococcus affords indisputable evidence of the existence of gonorrhoeal infection, it must be remembered that it is often difficult, and sometimes entirely impossible, to make the diagnosis with certainty; and for this reason it is possible that gonorrhoeal infection plays a much larger part in the causation of sterility than has until lately been believed.

The observant physician will in cases of sterile marriage frequently find in husband or wife or both, evidence of previous or still existent gonorrhoea; but he will cautiously weigh all the circumstances before deciding that such gonorrhoeal infection is the efficient cause of the sterility. In many cases, however, the etiological relation is too obvious to be overlooked, and we can trace all the distresses of the unfortunate wife to the injury she unwittingly received upon the momentous wedding night.

Still, we have to remember how extraordinarily common, more especially in the so-called upper classes of society, is gonorrhoeal infection, and what an enormous percentage of men entering upon married life have previously experienced one or more attacks of the disease—so that were sterility a frequent sequel of such infection, fertility would be the exception rather than the rule. By inquiry among friends and patients as to whether when they married they had previously suffered from gonorrhoea, in conjunction with information regarding the fruitfulness of their marriages, I have been led to the conclusion, which appears to me to be one of considerable importance, that the proportion of sterile to fruitful women among the wives of men who have suffered from gonorrhoea before marriage, is about the same as the proportional fertility of all marriages considered independently of gonorrhoeal infection, viz. 1:10. This

depends, as it appears to me, not only upon the fact that very frequently in men gonorrhoea is completely cured, but also upon the fact that in women gonorrhoeal infection does not necessarily cause sterility. It may indeed be regarded as definitely established that women actually suffering from gonorrhoea may become pregnant, and that the pregnancy may proceed to its natural termination. The recent investigations regarding the frequency with which gonococci may be detected in the genital secretions of pregnant and parturient women—and they are to be found in a surprisingly large percentage—suffice to prove that gonorrhoeal infection offers no insuperable obstacle to conception. That the discovery of gonococci in a man's urethra does not justify us with apodictic certainty in forbidding the man thus affected to marry is in fact proved by the following remarkable case, which came within my own experience. A young man who had had several attacks of acute gonorrhoea, wishing to marry, had himself examined by two specialists in genito-urinary disease. Both detected gonococci in his urethra, and both forbade him to marry. The patient, however, would not be advised, and married the lady of his choice; now, six years after marriage, he is the happy father of four blooming children, and his wife is in perfect health.

Gosselin, in an elaborate work published in 1853, was the first to point out the serious consequences as regards a man's future potentia generandi which are entailed by an attack of gonorrhoea followed by epididymitis. He insisted that the inflammation might lead to the obliteration at some point of the vas deferens, whereby the secretion of the testicle was prevented from mixing with the secretions of the prostate, Cowper's gland, and the seminal vesicle; and hence the ejaculated sperm was lacking in its principal constituent. In such cases, either in the epididymis (usually in the globus minor of that organ), or else in the course of the vas deferens, somewhere between the epididymis and the vesicula seminalis, some relic of the former inflammation is usually to be detected, the globus gonorrhoeicus, and this usually represents the seat of strangulation of the excretory duct of the testicle.

In the year 1872 *Nöggerath* published his book, written with flaming fiery zeal, entitled "Latent Gonorrhoea in the Female Sex." In the most startling colours he depicted all the misery and distress which formed the wedding gift of the gonorrhoea-infected husband to his wife; when sowing his wild oats, such a husband is preparing for the crop by which his young wife's happiness is destroyed, her health ruined, her life endangered, and her hopes of offsprings annulled. While we may admit that *Nöggerath's* motives were of the noblest, we cannot but wonder that the wickedness of the male sex has not yet entailed the destruction of the whole human race, overwhelmed as by a new fall of Sodom and Gomorrah.

Nöggerath maintained that 90% of men infected with gonorrhoea remained uncured; and that of the women married by men thus permanently infected with gonorrhoea, barely 10% remained free from the disease. It is gonorrhoeal infection, of which this author gives so gloomy a picture, which is, in his opinion, the principle cause of sterility in women. According to his observations, of 81 women thus infected, 49 remained absolutely sterile; only 31 became pregnant; 23 were delivered at full term, 3 had miscarriages, and 5 premature delivery. Thus, not so many as 1 in 3 of these women had a full-time child. Of the 23 who were delivered at full term, 12 never had more than 1 child each; 7 had 2 children each; 3 had 3 children each; 1 only had 4 children, the normal average fruit of healthy marriages. In all, the 81 women had only 39 children. If we take 4 to be the average number of the offspring of a healthy married pair, there was but one normal woman among the whole 81. Forty-nine were absolutely sterile; 11 of the remainder had 1 child, and did not again conceive during periods ranging from 3 to 18 years after the recorded delivery; thus there were 60 sterile women among 81.

Nöggerath's doctrine regarding the relation between gonorrhoeal infection and sterility obtained at first little credence — perhaps for the reason that he drew such far-reaching conclusions from so limited a material — *Schröder* mentions *Nöggerath's* opinions only to dismiss them as extravagant; but the idea that the husband was mainly to blame for the occurrence of sterility in marriage continued to form the topic of scientific discussion. The indignation which *Nöggerath's* assertions, unquestionably too sweeping, had aroused in gynecological circles, gradually subsided, as every gynecologist devoted his attention to supporting or refuting *Nöggerath's* conclusions.

It soon became evident, that gonorrhoea in the male had a deleterious influence upon the fertilizing quality of the semen, and this far more frequently than had previously been supposed. *Fürbringer*, as a result of the examination of 124 cases, laid down the important proposition, that when epididymitis or funiculitis gonorrhoeica duplex had been observed to occur, the probability that the patient would be an azoospermist was expressed by the ratio of 9:1, and this in direct opposition to the views of *Zeissl*, who had maintained that in this respect the consequences of gonorrhoea were trifling.

Seeligmann conducted a pathologico-anatomical investigation which led him to conclude that in cases of gonorrhoeal epididymitis, in addition to the inflammation of the epididymis, phlebitis and periphlebitis of the plexus pampiniformis occurs, and also lymphangitis of the extensive system of lymphatic vessels which pass through

the spermatic cord from the testicle; the changes left in the blood and lymphatic vessels by the inflammation, result in the testicle being for the future imperfectly nourished, and often therefore lead to impairment of the functions of this organ; thus the oligospermia so frequently seen as a sequel of gonorrhoeal epididymitis (the ejaculated semen containing but few spermatozoa, and these with little or no vitality), is not always due to a complete obliteration of the vasa deferentia by the inflammation, but in many cases to the functional derangements of the testicle brought about in the manner above described. It is probable also that lues may give rise to azoospermia as a result of endarteritic processes. The remarkable result of *Seeligmann's* investigations was that in as many as 75% of the sterile marriages that came under his observation, the husband was the one to blame.

Latterly, the view that gonorrhoeal infection plays a very considerable part in the etiology of sterility in women, has been widely accepted. Among German gynecologists, *Olshausen*, a man of enormous experience, considers that *Nöggerath's* book, notwithstanding much exaggeration, is substantially accurate in its main conclusions. A similar view of *Nöggerath's* work is taken by *E. Schwartz*, *Bandl*, *A. Martin*, and *Hofmeier*.

According to the exhaustive work of *E. Schwartz*, gonorrhoea is in women one of the commonest causes of sterility. Sterility due to this disease may be either primary or secondary. In some cases no ovum can find its way into the uterus, either because the ovaries are completely enveloped in masses of exudation and pseudo-membranes, or on account of dislocation of the ovaries and the Fallopian tubes, or because the tubes have been rendered impermeable by inflammatory stenosis or flexion, or by loss of their ciliated epithelium; in other cases the ovum, indeed, enters the uterus, but fails to be implanted upon the diseased mucous membrane; again, it is conceivable that even when ovum and spermatozoon are properly formed and encounter one another in the normal manner in the tube or in the uterine cavity, and when the uterine mucous membrane is in a condition suitable for the implantation of the fertilized ovum, contact with gonorrhoeal secretions may have impaired the vitality of the ovum or of the spermatozoon, or of both, to such a degree, that either fertilization fails to occur, or the fertilized ovum is incapable of further development. In some instances, sterility dates from the first infection of the wife; but more commonly it does not develop until after the completion of one or more pregnancies.

Hofmeier rightly points out that whilst gonorrhoeal infection in women may cause sterility, such sterility is by no means an inevitable consequence of the disease.

Other gynecologists are even more reserved in admitting the importance of gonorrhoea as a cause of sterility in women. *Fritsch* is of opinion that in many cases a casual relation is believed to exist, when in reality there is nothing more than a coincidence. Sterility and slight perimetritis, he remarks, are common in women; gonorrhoea is common in men. But it does not follow that the frequent gonorrhoea of the husbands is the sole cause of the frequent sterility and perimetritis of the wives. "For several years," he continues, "I have examined all the men I possibly could for evidence of the existence of gonorrhoea, and have enquired for a history of previous attacks of the disease. To my astonishment I discovered that the fathers of many children, whose wives had come to consult me for some quite disconnected condition, had quite as often suffered formerly from gonorrhoea as the husbands of sterile wives."

M. Saenger is one who very vigorously upholds *Nöggerath's* views. He insists that, excluding *puellae publicae* from consideration, no less than 12% of all gynecological disorders depend upon pathological processes referable to gonorrhoeal infection of the female genital organs. To establish this thesis, it is not necessary to prove that *Neisser's* gonococcus is or has been present; the diagnosis must be based principally upon clinical considerations. Chronic vaginitis and urethritis, inflammation of the uterine mucous membrane, tubal suppuration, oophoritis, and perimetritic adhesions (especially those which unite all the lateral pelvic organs into a shapeless knot)—these are conditions thoroughly characteristic of gonorrhoea.

No less unfavourable an influence of gonorrhoeal infection upon fertility is shown by the observations of *Glünder*. Women numbering 87 were in attendance at the gynecological department of the *Poliklinik* of the University of Berlin, all of them seeking advice on account of sterility. In the case of 24 of these, the husband was also present; 19 of these men admitted having previously suffered from gonorrhoea; the remaining 5 denied such infection, although the wives of all of these had symptoms pointing unmistakably to gonorrhoeal infection; among the other 63 women, there were 8 only in whom the genital organs were found perfectly normal, whilst in 38 of them there were signs of previous gonorrhoeal infection. Thus we see that of these 87 sterile women, 62 (71.3%) had had gonorrhoea; and *Glünder*, assuming that in these cases the gonorrhoea was the efficient cause of the sterility, and regarding the average percentage of sterile marriages as 12.34 in every 100 contracted, is led to the conclusion that of every eleven or twelve marriages, one is rendered sterile in consequence of gonorrhoea.

To the same opinion, that gonorrhoea is the principal cause of sterility, *Lier* and *Ascher* were led by an investigation of numerous clinical histories. Moreover, they believe that in the large majority of sterile marriages, the husband is directly or indirectly responsible. Directly, in so far as a very large percentage of men have their reproductive capacity annihilated by gonorrhoea; indirectly, because, of those who retain their fertilizing powers, so large a number infect their wives with gonorrhoea, and thus render them incapable of conceiving, that chronic gonorrhoea—in the female harder to eradicate even than in the male—must be regarded as the arch-enemy of fertility. Of 80 men affected with azoospermia, all cases observed by *Prochownik*, in 75 the disease was the sequel of gonorrhoea; of the remaining 5 cases, two were due to syphilitic disease of the testicles, one to tubercular disease of the same, whilst two were due to long continued masturbation, with consecutive atrophy of the testis and epididymis.

But that the obstacle offered to conception by gonorrhoeal infection is by no means so powerful as *Nöggerath* and his supporters believed, is shown by the investigations of *Oppenheimer*, who, in *Kehrer's* clinique at Heidelberg, examined 108 pregnant women for the presence of gonococci, and found these organisms, pathognomonic of gonorrhoeal infection, in no less than 30 of them, that is, in 27.7%. Thus, in this large number of cases, pregnancy had occurred notwithstanding the presence of gonorrhoea. *Lower*, again, in *Schröder's* clinique, examined 32 patients during the lying-in period, and detected the presence of gonococci in 26; an experience which also proves that gonorrhoeal infection is no bar to pregnancy. *Dunstone* has recently recorded 5 cases in which, notwithstanding the existence of gonorrhoea, the women became pregnant once or several times.

In the "Medical Brief" the question was mooted, "Can a woman have children subsequently to being infected with gonorrhoea?" Numerous affirmative answers were received; and among them one mentioning the case of a woman who was infected with gonorrhoea at the age of 18, and subsequently gave birth to 8 children.

The question of sterility in prostitutes has also attracted attention, since these women may be regarded as invariably infected with gonorrhoea. *Meissner* and *Jeannel* speak of the infertility of prostitutes as a well-known fact; and the latter states that, whereas, according to *Montesquieu*, to every 100 women in France, on an average 341 children are born, of which 200 grow up, to 100 prostitutes in Bordeaux there were born 60 children only, and of these but 21 attained maturity. *Marc d'Espine* affirms that among 2,000 prostitutes not more than two or three will have children in a year. *Parent-Duchatelet*, on the other hand, regards the sterility of

these women as a purely temporary affair, and writes: "les prostituées conçoivent souvent, mais elles avortent fréquemment;"¹ and this frequency of abortion he attributes to two causes, in the first place to deliberate induction of abortion, and in the second place, to their mode of life. He continues: "cette fécondité a lieu surtout lorsque, quittant leur mettier, elles se marient ou s'attachent à un seul homme; dans ce cas les grossesses se succèdent, elles sont toujours heureuses et les infants qui en proviennent sont aussi vivaces que les autres;"² thus, in his opinion the sterility of prostitutes lasts only as long as they pursue their occupation.

The question as to what influence, if any, gonorrhoeal secretion has *per se* upon the semen, has often been asked, but not yet satisfactorily answered. We have no certain knowledge whether the gonococci, the pus cells, or one of the toxins of the secretion, exercises a deleterious influence upon the vitality of the spermatozoa; it is certainly possible that this may be the case, for the diplococci, just as much as streptococci and staphylococci, are found not only within the cells, but also in the intercellular fluid and in the detritus, and so must be brought into intimate contact with the spermatozoa; but inasmuch as quite a number of persons who are at the time actually suffering from gonorrhoea beget children, we are compelled to assume that for the harmful influence, if any such exists, to be exercised, a prolonged contact of the semen with the gonorrhoeal pus is necessary. In cases of gonorrhoeal epididymitis and prostatitis, and also in gonorrhoeal urethritis, no such prolonged contact occurs; but when the vas deferens or the vesicula seminalis is inflamed, the contact is more prolonged, and may suffice to destroy the vitality of the spermatozoa, which are extremely sensitive to chemical stimuli. In 8 cases observed by *Kroner*, the fruitful coitus was unquestionably effected when the husband was suffering from still active gonorrhoea; in all the cases the children were born at full term, and all suffered from conjunctival blenorrhoea. That gonorrhoea often fails to induce sterility, is shown by the familiar fact that a woman frequently has one child after another, all infected with this conjunctival form of gonorrhoea, showing that the mother remains fertile notwithstanding the persistency of the gonorrhoeal infection.

Upon the investigation of 60 carefully written clinical histories, dealing with the relation between proved gonorrhoeal infection and a sterile marriage, *Grechen* has drawn up the following table,

¹ "Prostitutes conceive often, but abort frequently."

² "Prostitutes become fecund when, abandoning their profession, they marry, or pass under the protection of a single man; in such cases they become pregnant, they are always happy, and their children are as healthy as those of other women."

showing the various ways in which chronic gonorrhoea may give rise to sterility:

A. Absolute Sterility.

a. Owing to impossibility of fertilization, in consequence of defective formation of spermatozoon or ovum:

I. In the male:

1. Aspermatism.

2. Azoospermia.

II. In the female:

Oophoritis glandularis.

b. Owing to impossibility of pregnancy, although semen and ovum may be normal, and fertilization can be effected:

Gonorrhoeal endometritis of atrophic character.

B. Relative Sterility.

a. Owing to mechanical interference with the conjugation of spermatozoon and ovum:

I. In the male:

1. Epididymitis duplex.

2. Stricture impermeabilis urethae.

II. In the female:

1. Perioophoritis and perimetritis, and their results, viz., adhesions and displacements of the reproductive organs.

2. Tubal catarrh, pyosalpinx, kinking and other forms of obstruction of the tubes.

b. Owing to extension of the gonorrhoeal process to the decidua, causing abortion in the early period of pregnancy:

Endometritis gonorrhoeica chronica, and endometritis decidualis.

Benzler has endeavoured to elucidate the problem of the relations between gonorrhoea and sterility by a collective investigation in the army. The investigation was concerned with 474 men who during their period of service with the colours had been treated for gonorrhoea, and who subsequently had married. Dealing with all cases alike, without regard to complications which had been observed in some cases but not in others, of the 474 wives, there were 64 who never became pregnant = 13.5%; 78 who had one child only = 16.5%; total, 142 = 30%.

Leaving out of consideration the cases in which epididymitis had been observed, there remained 363 cases of uncomplicated urethritis; of the 363 wives of these men, there were 38 who never became pregnant = 10.5%; 63 who had one child only = 17.3%; total 101 = 27.8%.

Thus, in the cases in which the husbands had had uncomplicated urethritis, the percentage of absolute sterility was only 10.5; while

in the unselected cases of gonorrhoea, it was no more than 13.5. The figures show clearly that the influence of uncomplicated gonorrhoea is but trifling; indeed, it is obvious that this must be the case, for it is probable that not less than 80% of men experience at least one attack of gonorrhoea, and did this give rise to sterility, either directly by its influence on the men themselves, or indirectly by transmission to their wives, the human race would soon die out. Moreover, the frequent occurrence of ophthalmia neonatorum is a sufficient proof that notwithstanding gonorrhoeal infection in all these cases, pregnancy and delivery have taken place.

To sum up, it is my opinion that in recent years the influence of gonorrhoeal infection in inducing sterility in women has been painted in far too gloomy colours, and it is time that these extreme views should be abandoned.

This is a convenient place to insist upon the fact that in cases which are by no means rare, in the absence of aspermatism and azoospermia, and altogether independently of gonorrhoeal infection, it is the husband who is responsible for the occurrence of sterility; in such cases the sterility is due to failure of conjugation between spermatozoon and ovum, dependent upon congenital or acquired defects of the penis. The great majority of cases of this kind are due to hypospadias.

A case of sterile marriage is reported by *Lier* and *Ascher*, in which the husband had suffered from hypospadias and had been operated upon for the relief of that condition. Although erection of the penis was normal, and coitus terminated in the usual orgasm, with sense of ejaculation, the semen did not find its way into the vagina; it accumulated in the artificial cul-de-lac between the former abnormal urethral orifice and the artificially constructed meatus, and after coitus the semen had to be expelled from this region by digital pressure.

Micluch-Mackay reports that among the Australian aborigines, hypospadias is artificially induced, in order to prevent fertilization. In young boys, an incision is made through the lower wall of the urethra from the meatus as far up as the scrotum, and care is taken that the several surfaces do not reunite. During coitus, the semen flows away without entering the vagina. This mutilation is practised, not only in South and Central Australia, but also by the indigens of Port Darwin.

That hypospadias does not in all cases offer an insuperable obstacle to impregnation, is, however, shown by a striking case which came under the notice of *Labalbary*. He saw a hypospadiac who, in micturating, had to crouch down in the feminine posture, because he was unable to project the stream of urine forwards; in coitus, he deposited his semen only on his wife's vulva. But his wife gave

birth to two sons, about whose paternity there could be no reasonable doubt, since both exhibited the same malformation as their putative father.

Occasionally, phimosis offers an obstacle to impregnation, and only after relief of the condition by operation, is the wish for offspring fulfilled. A case of this nature is recorded by *Amussat*.

In cases of severe stricture of the urethra, sterility may result, although the constitution of the semen is perfectly normal. During erection of the penis, the stricture is completely closed, and the semen accumulates in the urethra above it; when the penis becomes flaccid, the semen flows away, outside the vagina. In some such cases, the semen regurgitates into the bladder, and is not discharged until the patient makes water. Although the supposition is not one in which strict proof is obtainable, it is probable that the man is at fault in cases in which the wives of two or more brothers fail to conceive. I have seen several instances of the kind. Three brothers, all quite healthy, and of virile aspect, were married to women in whom on gynecological examination no significant abnormality could be detected; they had been married respectively for 14, 9, and 8 years; all were childless. Three brothers, two of whom were practising physicians, had lived a number of years (20, 4, and 14, respectively) in sterile wedlock; one of them (a physician) informed me that he ejaculated always a very small quantity of semen, and thought it possible that this was the cause of the sterility. Of four brothers, two had lived long in barren wedlock; the third had no child for 14 years after marriage, when at last his wife became pregnant after a visit to a spa; the fourth brother is a misogynist and a confirmed bachelor.

Sexual Sensibility in Women.

In our consideration of the various influences by which the contact of ovum and spermatozoon may be prevented, the degree of sexual excitement experienced by the woman during the sexual act must not be overlooked, for this plays a part not to be underestimated, even though it is a matter on which it is difficult to obtain accurate information.

It is extremely probable that an active participation on the part of the woman in coitus has an important influence upon the attainment of fertilization, i. e., that sexual excitement in the woman is a link in the chain of conditions leading to conception. This excitement has a reflex influence, but the influence may be exercised in either (or both) of two ways: first, it may cause certain reflex changes in the cervical secretion, whereby the passage of the spermatozoa is facilitated; or, secondly, it may give rise to reflex changes

in the vaginal portion of the cervix, to a rounding of the os uteri externum and a hardening of the consistency of the cervix (changes of an erectile nature) coupled with a slight descent of the uterus — changes which likewise favour the entrance of the semen into the uterine cavity. *Theopold* goes so far as to say that it is only women who experience erotic excitement who are capable of being impregnated.

My own opinion is that considerable importance is to be attached to voluptuous excitement of the woman during coitus, for the former of the two reasons mentioned above, namely, because such excitement leads to the occurrence of reflex secretion of the cervical glands, the secretion thus produced maintaining or enhancing the activity of the spermatozoa; and contrariwise, in the absence of voluptuous excitement on the woman's part there is a failure of the reflex secretion, and the passage of the spermatozoa into the uterine cavity is consequently less easily effected. That sexual excitement has great influence upon the production of the first appearance of menstruation, has frequently been shown; and an analogy between such an influence and the suggested effect of sexual excitement in favouring the occurrence of conception, must not lightly be rejected. It is well known that the first menstruation occurs at an earlier age in girls living in towns than in those living in the country; not solely (if at all) in consequence of the better nutriment and easier life of the former, but also, unquestionably, owing to nervous influences. It is, moreover, a familiar experience that factory girls, who from early youth are exposed to sexual stimulation, attain sexual maturity at an extremely early age. Again, from early times it has been the prevailing opinion of the common people that for the impregnation of a woman it was necessary for her to experience voluptuous excitement, or at least, that in the absence of such excitement, conception was rendered difficult. *Riedel* relates of the indigens of the Island of Buru, that they often have sexual intercourse with foreigners, "but during such intercourse they remain quite passive, in order to avoid impregnation." It is not an unusual experience in gynecological practice for a sterile woman, in the absence of any prompting, to complain that during coitus she has no "feeling" whatever, and to attribute to this lack of feeling her failure to conceive.

A cultured lady, the mother of several children, assured me, not only that she was always aware, whether an act of intercourse would or would not lead to impregnation, but further, that it was within her power to determine whether the intercourse should or should not be fruitful. If she was passive during intercourse, or if, to use her own expression, her attitude was one of "laissez faire, laissez aller," conception would not occur; but if, on the other

hand, she took an active part in the coitus, so that she experienced a powerful voluptuous sensation, pregnancy would result from the intercourse.

In some cases, the previously described condition of dyspareunia is the cause of the sterility. In fact, the combination of dyspareunia with sterility is so strikingly common, that my own observations have led me to infer that there is a casual connexion between the two states, at least in a considerable proportion of cases.

I append a short note of a few instances of this kind: Mrs. G., aged 27, married 6 years, sterile; an anaemic, delicate lady, who has never experienced the sense of ejaculation. The semen flows away from the vagina immediately after the completion of coitus. No abnormality to be detected on gynecological examination. Mrs. S., aged 24, married 5 years, sterile; during intercourse remains completely cold, and has experienced the sense of ejaculation in dreams only. Gynecological examination disclosed the existence of slight cervical catarrh, but no other abnormality. Mrs. E., aged 30, married 10 years, had a child 9 years previously, a difficult delivery followed by puerperal disease, since then sterile; she states that since her delivery she has not experienced the sense of ejaculation, with which she was formerly familiar; further, since that time she has suffered from profluvium seminis. On gynecological examination the uterus was found to be enlarged and retroflexed. Mrs. K., aged 28, married 6 years, sterile; amenorrhoeic, has never experienced the sense of ejaculation, and finds sexual intercourse so unpleasant that, "in order to be left in peace," she has herself begged her husband to keep a mistress. Examination showed the uterus to be in an infantile condition.

Whilst I have notes of numerous cases similar to those just quoted, I must also insist upon the fact that I have sometimes had complaints of dyspareunia from wives whose fertility has been proved by the birth of numerous children. And, again, anyone whose position permits him frequent glimpses of what passes behind the scenes of married life, will from time to time have noticed as signs of relative dyspareunia instances in which the faithless wife is far more readily impregnated by her lover than by the husband to whom she is indifferent or whom she actually dislikes.

To relative dyspareunia dependent upon sexual dysharmony we must refer also those instances in which a man and a woman prove sterile while living together for a considerable period as man and wife, but after separation both prove fertile in fresh unions. Several such cases have come within my own experience, and similar instances attracted the attention of the observers of antiquity—*Aristotle*, for example. *Haller*, for this reason, lays stress on the lack

of mutual affection as a cause of sterility; and *Virey*, also, believes that sterility may often depend upon the absence of the "harmonie d'amour."

It is possible that the custom, which in certain rural districts has persisted into quite recent times, of a temporary experimental cohabitation of candidates for matrimony, was based on an attempt to discover the existence of such a sexual harmony. *Ploss*, for instance, reports that in East Prussia, in 1864, he was informed that among the Mazurs this custom of an experimental year of cohabitation was in force. If during this year the woman became pregnant, the young couple were married; but if pregnancy failed to occur, they separated, considering they were not formed for one another.

A well-known historical example of relative sterility is furnished by the two marriages of Napoleon I. His first marriage to Josephine remained sterile, though Josephine had children by Beauharnais; and Napoleon, remarried to Marie Louise, had a son by the latter.

Von Gutzeit, a physician of wide experience, points out that "sensitive women, who have a mental or physical antipathy to cohabitation, or who have a secret but ardent affection for some other man, often fail to conceive as a result of intercourse with their husbands; but when, in illicit intercourse, they experience the voluptuous sensations to which they have hitherto been strangers, pregnancy often speedily ensues." He maintains, further, that such women, in consequence of the stimulation of the genital organs in the absence of sexual gratification, become affected with all kinds of menstrual irregularities, with fluor albus, prolapse of the uterus, and chronic metritis; they suffer from digestive disturbances and constipation, leading to emaciation; and they are prone to hysterical manifestations."

Analogous phenomena have been noted, and with much greater distinctness, in the animal world. *Darwin*, writing on this subject, remarks: "It is by no means a rare occurrence, that certain males and females will not be fruitful in intercourse together, whilst the same individuals prove perfectly fertile in intercourse with other members of their species—and this in cases in which there is no evidence that the subsequent fertility is due to any change in the conditions of life. The cause is probably to be found in an innate sexual dysharmony between the infertile pair. A very large number of instances of this kind have been reported to me by well-known breeders of horses, cattle, pigs, dogs, and pigeons. Sometimes a breeder will fail to obtain offspring from a male and a female of known fertility whom he wishes to couple for some special reasons. The most celebrated living horse-breeder informed me

that frequently a mare, which in other seasons with other stallions has proved fertile, may be coupled with a stallion likewise of proved reproductive potency, and will fail to be impregnated; yet this same mare will shortly afterwards be impregnated by another stallion."

Pflüger reports that he has often seen a thoroughbred stallion, which was fully prepared, at a moment's notice, to serve a thoroughbred mare, prove extremely unwilling to serve a common mare on heat, and only induced to do so with the greatest difficulty, and indeed by a trick. The stallion is placed in the central one of three stalls, on one side of him is the thoroughbred mare, whilst in the third stall is the common mare, covered with a cloth. The stallion's head is turned to show him the thoroughbred mare; immediately his appearance undergoes a change. Every muscle of his body appears to quiver, and never does a fine animal appear more beautiful than at such a moment, full of pride, fire, and vitality.¹ As soon as the stallion makes ready to serve the mare, he is rapidly led to the other stall, and suitably assisted to the actual commencement of intercourse with the substituted mare. But it sometimes happens, as *Pflüger* himself has seen, that the stallion becoming aware of the deception, refuses to complete the coitus, withdraws his penis, and immediately turns to the mare of his choice.

Matthews Duncan, among 191 sterile women, found that 39 had no sexual appetite, and 62 had no voluptuous sensations during coitus. He regards abnormal sexual appetite as one of the principal causes of sterility.

Notwithstanding these facts, it must not be forgotten that many cases are recorded in medical literature of women conceiving after intercourse effected against their wishes, as by rape, or when they were in a state of intoxication, or asleep, or in the entire absence of all voluptuous sensation. Moreover, the erection of the vaginal portion of the cervix, and the reflex movements and secretory changes in the uterus, may also occur independently of sexual desire and voluptuous sensation; but such cases are certainly exceptional, and their credibility is frequently open to suspicion. In

¹ Compare stanzas 46 and 47 of "Venus and Adonis":

His ears up-prick'd; his braided hanging mane
Upon his compass'd crest now stands on end;
His nostrils drink the air, and forth again,
As from a furnace, vapours does he send:
His eye, which scornfully glisters like fire,
Shows his hot courage and his high desire. }

Sometimes he trots, as if he told the steps,
With gentle majesty and modest pride;
Anon he rears upright, curvets and leaps,
As who should say, "Lo! thus my strength is tried;
And this I do to captivate the eye
Of the fair breeder that is standing by."

numerous instances in which conception is stated to have followed intercourse in a state of unconsciousness, judicial proceedings have elicited the fact that the intercourse was not entirely involuntary on the woman's part, and that the alleged force was no more than a *vis grata*. *Von Maschka* reports a case in which a girl asserted that she had been violated whilst in a condition of epileptic unconsciousness, but she remembered every detail of the act with precision. *Casper*, again, in a case in which it was asserted that defloration had been forcibly effected whilst the girl was in a state of alcoholic coma, showed that there had been no more than moderate intoxication combined with great sexual excitement. Assertions that pregnancy has resulted from intercourse effected during sleep, in a state of unconsciousness, or in the "magnetic" or "hypnotic" state, should always be accepted with reserve.

It is interesting to note in this connexion that the Chinese physicians enumerates among the causes of sterility the practice of "cong fou" by the man, this name being given to a manipulation analogous to hypnotism, whereby the voluptuous sensation during intercourse is diminished or abolished by distracting the attention elsewhere.

A proof of the importance of specific sexual sensation for the attainment of conception is afforded by the fact that in the majority of women voluptuous excitement is absent at the first act of intercourse, and only gradually develops thereafter; in correspondence with this, we find that the first conception does not usually occur until some time after marriage, and that the period of its occurrence frequently coincides with the full development of voluptuous sensation during intercourse. Thus, even in the woman fully fitted for conception, the actual capacity for impregnation is only developed gradually, and after a sufficient experience of intercourse.

This transient incapacity for conception may, indeed, also depend upon the fact that at first coitus is apt to be incompletely effected, and for this both husband and wife are to blame; but unquestionably in many cases the reason is the one first mentioned.

In some cases, certain psychical influences which affect the intensity of the voluptuous sensation, manifest its significance. Thus, in some instances, the influence of stimulation of the clitoris in leading to conception has been clearly shown; in others, the performance of coitus in some unusual position, varying with the woman concerned, is alone competent to arouse sexual sensibility to its full extent, and to bring about the orgasm. One occasionally receives confidential information from a husband that his wife experiences a voluptuous sensation only when coitus is performed in the lateral posture, or *more bestiarum*, or in the *situs inversus*, etc., etc.

Excessive frequency of intercourse, prolonged and repeated sexual excitement, on the other hand, induce sterility, as is well seen in prostitutes, who rarely become pregnant.

Finally, perverse sexual impulse must be mentioned as a possible cause of sterility. This may be an acquired perversion, due to the fact that at the epoch of the menarche, the commencement of puberty, owing to the strength of sexual desire whilst intercourse is an impossibility, or simply from evil example, the girl has become a confirmed onanist, and continues the habit even after marriage: In other cases we have to do with a psychopathic state, a form of mental degeneration due to very various causes, or in some cases inverted sexual sensibility exists in a person whose mind is in other respects normal. In women with sexual inversion, ordinary copulation with the male is insufficient to arouse the sexual orgasm, and for this reason, as well as because persons thus affected avoid coitus as much as possible, sterility commonly ensues.

In sterile homosexual women, and equally so in women addicted to masturbation, gynecological examination may disclose no abnormality whatever; but in other cases of the kind we may find a contributory cause of sterility in the fact that the internal genital organs are imperfectly developed, or even completely absent. In sterile women, if on gynecological examination we find certain characteristic changes in the reproductive organs, a strong suspicion will be aroused that the sterility is due to abnormal modes of sexual gratification. The changes in question are: hypertrophy of the clitoris, enlargement and a bluish colouration of the labia minora, retroversion of the uterus, neuralgia and displacement of the ovaries, leucorrhoea, and menorrhagia.

The question has been mooted by *Cohnstein*, whether, as is commonly assumed, a woman is capable of becoming pregnant at any time during the year, or whether, as in the lower animals, the reproductive capacity can be exercised only at certain seasons, or again, whether there may not be individual moments of predilection for the occurrence of conception. He found that in the great majority of women there were such seasons of predilection, and only in a minority could conception be effected indifferently at any time of the year. As a proof of this assertion, he appends the following case: A married woman, 33 years of age, had several years before been delivered prematurely of a stillborn child, and since then had not again been pregnant. Her reproductive organs were normal. The husband's semen was examined, and also found to be quite free from abnormality. In the course of the three following years an attempt was made to cure the sterility by dilatation of the cervical canal, suggestions for the proper regulation of sexual intercourse, etc., but all without effect. *Cohnstein* now calculated

the date at which the full term of the previous pregnancy would have fallen, and found that this was the middle of February; he therefore inferred that intercourse effected at the beginning of May would result in impregnation. As a fact, the woman conceived at this time, and at full term gave birth to a healthy girl. The assumption that such a time of predilection for the occurrence of conception exists is, however, contradicted by the well known fact that in the case of large families the children's birthdays are irregularly distributed throughout the year.

Baker-Brown describes a special form of sterility due to "sympathetic or reflex action." It depends upon diseases of the organs adjoining the uterus, such as vascular tumours of the urethra, bleeding piles, fistula, fissure, and prolapse of the anus, schirrus of the rectum, ascarides. "These diseases produce sterility in consequence of the loss of blood, the menstrual disturbances, the morbid congestion of the uterine system, and the reflex neuroses, to which they give rise." *Courty* reports a case belonging to this category in which in a young married lady sterility was due to fissure of the anus, which had long existed without recognition; after the fissure had healed, conception occurred. *Palmy* recently reported a case in which "taenia solium was the cause of sterility. In a woman 20 years of age, who had lived in sterile wedlock for three years, the presence in the intestine of a tapeworm, which she had harboured for many years, gave rise to dysmenorrhoeal troubles. The complete expulsion of the worm relieved the dysmenorrhoea, the woman became pregnant, and gave birth to a child at full term; since then menstruation has been painless." The presence of the tapeworm may have had an unfavourable influence upon the blood-supply and the innervation of the uterus. But cases of this nature do not constitute a special form of sterility; they must be classed, either with cases due to interference with ovulation, or with those due to prevention of the contact of ovum and spermatozoon.

Incapacity for Incubation of the Ovum.

The fertilization of the ovum is, as previously described, probably effected in man, as in other mammals, in the upper third of the Fallopian tube. The fertilized ovum is then swept down into the uterus by the action of the cilia which line the tube, assisted by the peristaltic movement of the muscular wall of the canal. The uterine mucous membrane at this time is thickened and thrown into folds, and in these latter the fertilized ovum is entangled; by its presence the ovum now exerts a reflex stimulus leading to a still greater proliferation of the cells of the uterine mucous membrane, which grows up over the ovum and

soon shuts it off completely from the uterine cavity. Thus the ovum comes to be entirely imbedded in the substance of the mucous membrane.

Thus for the implantation of the ovum, it is first of all necessary that the uterine mucous membrane should be in a normal condition; pathological changes in this membrane, and indeed any morbid structural alteration in the uterine tissues, may prevent the implantation and incubation of the ovum, and may thus give rise to sterility.

The uterine cavity is normally lined with ciliated epithelium, the cells of which have an elongated elliptical form. The movement of the cilia is directed downwards. The epithelium is perforated by the orifices of the uterine glands; these glands are simple tubular glands, passing through the mucous membrane with an S-shaped or corkscrew curve; between the glands lies a rich germinal tissue, made up of rounded cells. The rounded connective tissue cells have processes which build up the scaffolding of the mucous membrane. Among the connective tissue cells of the uterine mucous membrane, wandering leucocytes are almost always to be seen. Menstruation is characterized by a swelling of the mucous membrane, and by enlargement of the uterine glands. At the same time, blood extravasations appear between the more superficial layers of the membrane, and on its free surface, and various portions of the surface of the membrane are cast off.

Very numerous are the morbid states of the uterus and its annexa whereby the implantation and incubation of the ovum are prevented; and incapacity of the uterus for the fulfilment of these functions is therefore a common cause of sterility in women.

That developmental defects of the uterus, even when they are not such as render conception impossible, may yet often give rise to sterility, has been already explained in writing of the conditions of the uterus which prevent the contact of ovum and spermatozoon; for defects of development which are not sufficiently severe to prevent this contact, may yet suffice to render the uterus unfit for the implantation and incubation of the fertilized ovum. Inflammatory disorders, such as perimetritis and the formation of exudations in the parametrium, may render the uterus unable to undergo the enlargement necessary to pregnancy. Tissue changes in the uterine musculature may likewise prevent the implantation of the ovum, or the proper development of the uterus during pregnancy. New-growths of the uterus or its neighbourhood may bring the development of the fertilized ovum to an untimely conclusion. Above all, however, it is diseases of the uterine mucous membrane which unfit the organ for the implantation of the ovum, and thus give rise to sterility. All those inflammatory states which lead either to softening or to induration of the uterine parenchyma, or to swelling and

thickening of the endometrium or parametrium, may offer a hindrance more or less serious to the normal incubation of the ovum.

The diagnosis whether in an individual case we have to do with sterility dependent upon *impotentia gestandi*, is often difficult, because the conditions which cause it are frequently associated with those which cause sterility by preventing the contact of ovum and spermatozoon. In any case, a careful examination of the pelvic organs must be made, not only to determine whether there is any displacement or enlargement of the uterus, chronic metritis or perimetritis, parametric exudations, or new growths of the uterus or of neighbouring organs, but also, if necessary by dilating the cervical canal, to ascertain the condition of the uterine mucous membrane, and whether there is hyperplasia or atrophy thereof. In this connexion, examination of the uterine secretion is of especial importance: a purely mucous, transparent, vitreous, tenacious secretion in the os and in the cervical canal, indicates the existence of catarrhal endometritis; a markedly haemorrhagic secretion signifies hyperplastic endometritis; profuse purulent secretion containing gonococci, indicates gonorrhoeal endometritis; the discharge of pieces of membrane shows that there is exfoliative endometritis; the discovery of fragments of carcinomatous tissue indicates the breaking down of a malignant tumour of this nature; etc.

Finally, it is necessary to obtain a careful history of the case, asking whether there have been menstrual irregularities, or miscarriages, and the characters of previous labours (in cases of acquired sterility); any pathological conditions in other organs should be investigated; and the condition of the blood and the state of general nutrition should receive attention. Chlorosis, anaemia, and scrofula often give rise to catarrhal endometritis; severe disease of the heart may lead to congestive troubles of the genital organs; after abortion or difficult labour, chronic metritis or endometritis are common. Further, the differential diagnosis between erosion and carcinoma of the portio vaginalis, must often depend upon consideration of the patient's age and general health, and upon the nature and duration of the haemorrhage. Pain on micturition, appearing soon after marriage, and lasting often a few days only, will indicate the probability of gonorrhoeal infection, etc.

Von Grönewaldt has vigorously insisted upon the fact that the notion of sterility, i. e., *impotentia generandi* in women, is not coincident with the notion of *impotentia concipiendi*, and there is an important distinction between cases in which it is impossible that fertilization should be effected, and cases in which, though fertilization may take place, the implantation and incubation of the ovum fail to ensue. In this author's opinion, the only absolute mechanical hindrance to the entrance of the semen is to be found in atresia of

the genital passage, and the role of *impotentia concipiendi* is of quite minor importance as compared with incapacity on the part of the uterus for the implantation and incubation of the ovum, an opinion, which, notwithstanding the record of exceptional cases in which pregnancy has occurred in spite of the existence of mechanical obstacles to conception, I must regard as altogether beyond the mark. On the other hand, it is indisputable that for the occurrence of pregnancy it is necessary, not only that contact of ovum and spermatozoon should be possible, but further, that the uterus should be in a condition favourable for the implantation and further development of the ovum subsequent to fertilization. For this reason, diseases of the uterine tissues must play an important part in the causation of sterility, though we cannot go so far as to admit with *von Grönewaldt* that these diseases are the *principal* cause of reproductive incapacity in women.

Various metritic processes, and also venous hyperaemia consequent upon heart disease, may lead to atrophy of the uterine mucous membrane, which then appears thin and smooth, whilst the uterine glands are destroyed, or transformed into small cysts. The same condition may result from retention of secretions in the uterine cavity — hydrometra and haematometra. In all these cases, the epithelium probably loses its cilia. The process has a serious influence antagonistic to the reproductive capacity inasmuch as the implantation of the chorionic villi is rendered difficult (*Klebs*).

Hyperplasia of the uterine parenchyma, affecting either the whole organ or a large part, and characterized either by enlargement of the entire organ, or only by thickening and elongation of the cervix, may hinder the incubation of the ovum. It may be due to endometritic catarrhal processes; to venous hyperaemia, especially in cases of valvular heart disease; to subinvolution; and sometimes to excessive sexual stimulation, as in prostitutes. Both the change in the shape of the cervix, and the changes undergone by the uterine mucous membrane in cases of extensive uterine hyperplasia (it commonly becomes atrophic and discharges a watery secretion), interfere with the reproductive capacity.

In all cases of chronic metritis, the hyperaemia and hyperplasia of the uterus may give rise to haemorrhages; these sweep away the ovum, and thus lead to *impotentia gestandi*. And the nutritive changes in the mucous membrane that occur in chronic metritis also interfere with the implantation and incubation of the ovum. Moreover, it is well known that in these cases, even if conception is effected, abortion is extremely apt to occur, owing to the pathological state of the endometrium, which interferes with the normal development of the decidua. Haemorrhages occur in the decidua, and are followed by abortion. And further, the replacement of portions

of the muscular tissue of the uterine wall by fibrous tissue, a change which is apt to occur in long continued metritis, interferes with the proper expansion of the uterus during pregnancy, and thus leads to abortion.

On the other hand, it cannot be denied that frequently enough patients with well marked chronic metritis nevertheless conceive in a normal manner, and give birth to a healthy child; and this not once only, but again and again.

As sterility due to mesometritis, *von Grönewaldt* classes the numerous cases in which sterility ensues upon a confinement in which the patient reports that inflammation followed delivery—or sometimes in which nothing abnormal was noticed. The results of local examination are negative: there is no displacement, no exudation or swelling, and no relevant affection of the endometrium. But the characteristic feature of these cases is, according to *von Grönewaldt*, that after her last full-time delivery, a woman has had a miscarriage or a premature delivery, and subsequently has been completely sterile. The degenerative process is at first partial, so that it does not prevent conception, but renders it impossible for the pregnancy to go on to full term; subsequently it extends throughout the mesometrium, and conception is no longer possible.

Cole of San Francisco regards as the most frequent cause of sterility ensuing upon a single delivery, subinvolution of the uterus, most commonly due to rising too early after delivery. He therefore considers it of especial importance after a first delivery that the physician should satisfy himself that no serious injury has been effected by the process.

Chronic endometritis is a very frequent cause of sterility: in the first place, the catarrhal swelling of the mucous membrane, which often extends from the os uteri externum to the ostium abdominale of the Fallopian tubes, offers an obstacle alike to the downward passage of the ovum and the upward passage of the spermatozoa; and secondly, in long standing cases, the large size of the uterine cavity and the smoothness of the surface of the atrophied mucous membrane, render the lodgment of the ovum in the uterus very unlikely. A further powerful obstacle to impregnation in cases of endometritis is offered by the profuse muco-purulent secretion which usually, though not invariably, accompanies that disease. This secretion, in some cases flowing freely over the surface of the membrane, but in others adhering to it with tenacity, whitish-yellow in colour, rendered cloudy by admixture of pus, or tinted red by admixture of blood, sometimes of a gelatinous consistency with a strongly alkaline reaction, contains globules of mucus, ciliated and cylindrical epithelial cells, pus corpuscles, bacteria and cocci,—and, if the endometritis is of gonorrhoeal origin, the gonococcus of

Neisser. This secretion, when profuse and thinly fluid, pours out through the os, and sweeps away the semen; when tenacious and gelatinous, it fills up the dilated cervical canal above the constricted os uteri externum, and constitutes a powerful barrier to the upward passage of the spermatozoa; when purulent, it is destructive to the vital activity of the spermatozoa. The changes in the mucous membrane in cases of long standing endometritis whereby the uterus is rendered unfit for the implantation and incubation of the ovum, are the following. The epithelial cells, as usual in cases of continued catarrh, change in form, the ciliated cells disappear, and are replaced, first by cylindrical cells, later by polymorphic cells, approaching in type those of pavement epithelium. The mucous membrane is swelled, the vessels are dilated, there is hyperplasia of the glands, with a moderate amount of small-celled infiltration of the intergland-

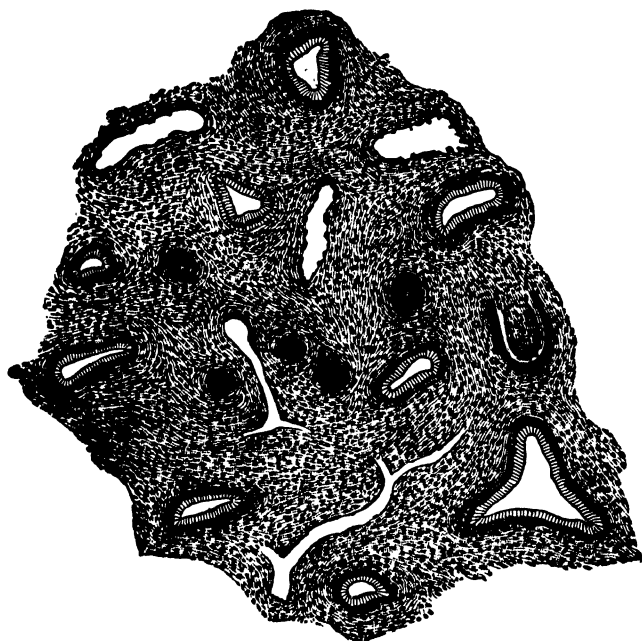


FIG. 83.—Uterine Mucous Membrane in Endometritis. (After A. Martin.)

dular tissue (Fig. 83). Ultimately the mucous membrane undergoes atrophy, its glands disappear, it comes to resemble a thin stratum of connective tissue.

Thus, in severe and long-continued endometritis, the changes that occur in the uterine mucous membrane render the implantation of

the ovum and the formation of normal decidua impossible; even if conception does occur, the fertilized ovum is speedily discharged. Frequently, in cases of endometritis, there is consecutive displacement of the uterus which acts as a contributory cause of sterility. When endometritis lasts a long time, proliferation of connective tissue in the uterine parenchyma also occurs, leading often to hypertrophy of the cervix, and to stenosis of the cervical canal. Since in so many different ways endometritis may give rise to sterility, the importance that must be attached to this condition is evident.

The great significance of gonorrhoeal infection in relation to sterility in women depends, not only on the changes this disease causes in the Fallopian tubes, leading to interference with the necessary contact of ovum and spermatozoon, but further, upon the occurrence of gonorrhoeal cervical and corporal endometritis, of perimetritis, and secondary parenchymatous metritis. Still, under appropriate treatment, the inflammatory changes consequent on gonorrhoeal infection are in many cases curable, and, after absorption of the exudations and restoration of the normal nutritive conditions of the tissues, conception may take place. *Fritsch*, who points out that in the woman infected with gonorrhoea, sterility ensues in a manner analogous to that in which it occurs in the male (for in the latter it is not the primary urethritis, the disease of the passage, but the secondary inflammation of the testicle that leads to sterility), states that he has observed cases in which beyond question conception has occurred, notwithstanding the existence of gonorrhoeal endometritis.

In my own experience, whilst gonorrhoeal endometritis is, among inflammations of the endometrium, the most frequent cause of sterility, the place of next importance in this connexion is occupied by exfoliative endometritis, or membranous dysmenorrhoea. This name is given to a pathological condition in which from time to time, usually during menstruation, fragments of membrane, or even an entire sac-like cast of the uterine cavity, are expelled from the uterus; since this condition is apt to hinder the incubation of the ovum, it is commonly associated with sterility—a fact mentioned already by *Denman* in 1790, and since then confirmed by numerous observers. I have had under observation several cases of dysmenorrhoea membranacea; in two cases it existed from the time of marriage—in one case 14 years, in the other 8 years—and in both sterility was absolute. In the latter of the two cases, vigorous treatment was undertaken, even curettage of the uterus, but quite without avail. In other cases, the sterility was acquired, the membranous dysmenorrhoea having begun after the woman had already had one or more children; but as I have never seen a case in which a woman became pregnant after the development of this affection, I am compelled to regard it as one of the most severe hindrances to conception.

As a general rule, exfoliative endometritis terminates only with the onset of the climacteric age; in very exceptional cases, however, a cure may take place earlier. In cases in which this premature termination has been observed, pregnancy has been known to ensue, cases of this nature having been observed by *Solowieff*, *Fordyce Barker*, and *Thomas*. And recently, cases have been reported, in which the disease has returned after such a pregnancy. *Fritsch*, indeed, is of opinion that exfoliative endometritis does not cause sterility, and that in this disease abortion is no commoner than in other diseases of the uterus. *Charpignon*, *Hennig*, and *Bordier* have also observed conception occur in the course of this disease. In 42 cases of membranous dysmenorrhoea collected by *Kleinwächter*, pregnancy occurred in four during the existence of the disease. *Löhlein* also reports that, among 27 patients affected with membranous dysmenorrhoea, six became pregnant, after the symptoms had been clear and unmistakable for a shorter or longer period. Two of these patients had been already pregnant before the first appearance of the exfoliative endometritis; subsequently they became pregnant and were delivered at full term. The other four had suffered for varying periods and with varying severity from the affection, before they first became pregnant. In three of these cases curettage of the uterus was performed; but in one only, in which pregnancy ensued very speedily on the operation, could a causal connexion be inferred. In two of the cases the mothers of the patient had also suffered from the affection.

It has been asserted by *B. Schultze* and others that curettage of the uterus renders it difficult or impossible for pregnancy subsequently to occur. There is, however, no evidence to justify such an opinion.

Especial attention should be given to inflammatory processes in the perimetrium and the parametrium as diseases giving rise to sterility in women. They are extremely common, and at times are so insidious, running their course without giving rise either to pain or to fever, that even when very extensive, and even when they have led to the formation of secondary tumour-growths, they may yet be overlooked. Hence their pathological significance in the causation of sterility in women is still underestimated. Chronic pelvic peritonitis and parametritis may lead to the onset of sterility in various ways: changes may occur in the cervix, this organ becoming indurated, fixed, and retroposed, and painful when the uterus is moved; inflammatory changes may affect the body of the uterus, the ligaments of the ovary, and various portions of the pelvic peritoneum; displacement of the uterus may occur; one or both ovaries or tubes may be dislocated and fixed, either to the side of the uterus, or behind it, in the pouch of Douglas; all kinds of adhesions or in-

flammatory nodules may result from these processes. Further, in the scarred, contracted, sclerosed parametric tissue, the blood and lymphatic vessels of the parametrium are compressed, and in part obliterated, and the intimate connexion between the pelvic cellular tissue and the uterus readily leads to the onset of endometritis, whereby the implantation of the ovum is interfered with. The occurrence of sterility in cases of pelvic peritonitis and parametritis, depends in part on the indirect effects of the inflammatory exudations, and in part on the direct result of the extension of the inflammation to other regions. The perimetritis, parametritis, and pelvic peritonitis that result from gonorrhoeal infection have thus an especially disastrous influence, for the reason that in these cases cervical metritis and endometritis with blenorhoea are commonly superadded. This is the principal cause of the almost invariable sterility of prostitutes, in whom, however, we must also take into consideration the influence of the absence of voluptuous sensation in an act which to them has become a mere matter of business. The investigations of *Bandl* in the post mortem room show that residues of perimetritic and parametritic inflammation are to be found in the bodies of 58.4% of parous women, and 33.3% of the bodies of women (married or unmarried) who have had experience of sexual intercourse but have never had a child. This, he thinks, is the explanation of the great frequency of childless marriages and of relative sterility in women. In the nulliparae mentioned above, *Bandl* commonly found an indurated, functionless, in places cicatrized, narrowed cervix, paraophoritic and perisalpingitic residues, and morbid changes in the tubes and the ovaries. In some cases also the husbands of such sterile women were found to be affected with azoospermia. The connexion between azoospermia in men and the discovery of inflammatory residues in their childless wives, is a very intimate one. The husband at the time of marriage was suffering from an imperfectly cured gonorrhoea, and infected his wife. In the other class of cases, in which the women had had children, and subsequently become sterile, the limitation of fertility depended chiefly upon inflammatory residues in and around the ovaries and the tubes. In the majority of such cases, pregnancy is not rendered impossible, but merely difficult, for, notwithstanding the presence of very extensive inflammatory residues, the tubes are often pervious, and the ovaries fully or partially functional. Therefore, even in cases in which intra-pelvic inflammation has been very severe, we must be cautious in giving a prognosis that pregnancy has been rendered impossible, for the cases in which both ovaries are imbedded completely in pseudo-membranes, or in which both tubes have been rendered impervious, are unquestionably rare.

Carcinoma of the uterus rarely causes sterility. In its initial stages, in which there is merely papillary proliferation of the portio vaginalis, or carcinomatous infiltration of the deeper layers of the mucous membrane, no hindrance is offered to conception; but even in the later stages of the disease, when ulceration has occurred, and when there is extensive necrosis of the cancerous masses, there is not necessarily any absolute impossibility of the occurrence of conception, so long as cohabitation remains possible, and no insuperable hindrance has risen to the contact of ovum and spermatozoon. The cases are numerous in which pregnancy has been observed, notwithstanding extensive carcinomatous disease of the cervix, with necrosis of the tumour tissue; and *Cohnstein* even asserts, though in this he goes too far, that cancer of the cervix actually favours impregnation. Among 127 cases of this kind, there were 21 in which the disease had existed for a year or more before the occurrence of conception.

Winckel summarizes in the three following propositions his experience regarding the relation between uterine carcinoma and sterility: 1. Married women form the very large majority of those affected with carcinoma of the uterus; 2. The marriage of such women has very rarely proved sterile; 3. On the contrary, the women affected with this disease have generally been exceptionally fertile.

Other tumours of the uterus cause sterility, not merely by giving rise to mechanical interference with the necessary contact of ovum and spermatozoon, but also by leading to catarrhal states and hyperplasia of the mucous membrane, which interfere with the implantation of the ovum, even when fertilization has been effected. Uterine polypi give rise to mechanical obstruction of the os uteri externum or of the cervical canal; but they predispose to sterility in an additional way, inasmuch as in a woman affected with such a new growth any vigorous bodily movement is apt to cause profuse uterine haemorrhage.

In cases of myoma of the uterus, apart from the mechanical hindrances to conception imposed by these tumours, there is also interference with the implantation of the ovum. When numerous myomata have formed in the uterine wall, the mucous membrane is usually smooth and atrophied, and discharges a watery secretion, and for these reasons the imbedding of the ovum in the uterine cavity is rendered extremely difficult. But that there is often an additional cause of sterility in cases of myomata uteri, has been shown by the researches of *Schorler*, who examined 822 patients affected with fibromyoma of the uterus. He found that in most of those in whom sterility was observed, the tumours were not submucous but subserous, and that the sterility was to be explained

in these cases by the frequent occurrence of partial peritonitis, with its evil results to the uterine annexa.

Schorler appends the following table:

	Sterile.	Per-centage.
Of 85 women with interstitial myoma	21	24.7
Of 92 women with subserous myoma	44	47.8
Of 18 women with submucous myoma	7	38.8
Of 44 women with polypous myoma	4	9.0
Of 14 women with cervical myoma	3	18.7
253	79	31.2

When there are polypous new formations in the uterine cavity, even if conception occurs, abortion follows, for the reason that the rupture of the hypertrophied capillaries in the growths themselves and in the neighbouring tissues, prevents the normal development of the embryo. *Horwitz* has, however, described a case in which pregnancy went on to full term, notwithstanding the existence of growths of this nature.

Owing to the frequency with which chronic metritis and endometritis ensue upon parturition, it can readily be understood that delivery itself is often the primary cause of subsequent sterility. A temporary sterility often follows the first delivery. It is well known that the birth of boys is in general more difficult than the birth of girls; *Pfankuch* collecting information regarding the first and second deliveries of 300 married women, ascertained that after 166 of the first deliveries, in which boys were born, the average lapse of time to the second delivery was 30.2 months, whereas after 134 of the first deliveries in which girls were born, the average lapse of time to the second delivery was only 27.4 months.

The importance of previous delivery in leading to sterility, in consequence of mesometritis and diffuse connective tissue hyperplasia of the uterus, is shown by *von Grünewaldt*, who published the following figures as a result of his investigations. Of 56 women affected with chronic metritis, 46.4% were sterile; in 19.2% of these the sterility was congenital, in 80.7% it was acquired. Of 134 women suffering from myometritis and its consequences, 71.6% were sterile; in 17.7 of these the sterility was congenital, and in 82.2% it was acquired. On the other hand, of 321 women suffering from endometritis, 29.5% were sterile; in 28.4% of these the sterility was congenital, and in 71.5% it was acquired.

Lier and *Ascher* also insist upon the importance of puerperal diseases in the causation of acquired sterility, basing their opinion upon *Prochownick's* clinical material. They draw, however, the following distinction. If the puerperal infection takes place by way of the external organs of reproduction, through the vagina to the

cervix and thence to the connective tissue of the pelvis—the most common form, that which occurs soonest after delivery, and the most severe in its course—the women thus affected are likely soon to become pregnant again; if, on the other hand, the disease is pelvic peritonitis, the exciting cause of the inflammation proceeding from the interior of the uterus through the Fallopian tubes to reach the peritoneum, in the majority of cases the women thus affected will prove sterile for a long time or in perpetuity. In almost all the cases in which sterility resulted, the pelvic peritoneum had been severely affected by the puerperal inflammation. Regarding sterility in women, the two following general propositions are laid down by *Lier* and *Ascher*: 1. Hardly any single cause of sterility in women is so severe as to be competent by itself to render sterility inevitable throughout the period of sexual maturity, with the exception of defects of development and premature cessation of sexual activity. 2. Most of the hindrances to conception in women depend upon affections of the internal superficies of the reproductive organs, from the vulval mucous membrane upwards to the pelvic peritoneum; of these, the most important are affections of the endometrium.

On the other hand, it must not be forgotten, that the general tendency of a previous delivery is to increase the capacity for impregnation. *Olshausen* especially insists upon the well-known gynecological fact, that as a result of the first delivery, there occurs an enlargement of the os uteri, which facilitates conception throughout the remainder of the period of sexual maturity. This is well shown by the not infrequent cases in which sterility persists for several years after marriage, and then, with or without artificial aid, the first pregnancy occurs; thereafter one child after another appears in rapid succession.

Spiegelberg has pointed out that cervical lacerations may give rise to sterility by interference with the incubation of the ovum. *Olshausen* maintains that this affection is liable to cause abortion, for the reason that by the gaping of the cervical canal the inferior pole of the ovum is from time to time exposed, and this gives rise to reflex contractions of the uterus.

Von Grünewaldt publishes figures in support of his opinion that disturbances of the integrity of the uterus, whereby the implantation and further development of the ovum are interfered with, play on a whole a greater part in the causation of sterility than the various conditions previously described which interfere with contact of ovum and spermatozoon. But in this, we think, he goes too far.

Finally, in this connexion, must be mentioned among the hindrances to fertilization, sexual excesses, such as are so common during the first weeks of married life. Too frequent coitus gives rise to

enduring congestion of the uterus, and hence to an irritable state of the uterine mucous membrane, whereby the implantation of the ovum is rendered difficult. In prostitutes chronic metritis, due to the excessive frequency of intercourse, may be a contributory cause of the sterility which is almost invariable in these women; doubtless, however, the principal cause of their sterility is gonorrhoeal perimetritis.

As a variety of the third kind of sterility, sterility due to incapacity for implantation or further development of the ovum, must be classed the cases in which, though conception and implantation of the ovum are known to occur, and the first stages of development of the embryo certainly take place, the woman proves incapable of giving birth to a viable infant. Some of these cases depend upon abnormal modes of development, myxoma of the chorion and the like. In rare cases, women abort every month, discharging every four weeks a fully developed decidua vera, in which sometimes no trace of ovum can be detected. But this monthly abortion ceases as soon as marital relations are interrupted.

It would be passing beyond the scope of this work to discuss the pathological processes which lead to premature interruption of the pregnancy, after conception, implantation of the ovum, and the first stages of development, have occurred in a normal manner; to discuss, in short, the causes of abortion. Moreover, these pathological processes are outside the concept of sterility. It is sufficient here to enumerate the principal conditions in which abortion occurs. They are: various tissue disorders of the uterus, chronic hyperaemia of the mucosa, displacement of the uterus with fixation, parametric and perimetric exudations, laceration of the cervix with ectropium; further, various constitutional disorders, such as the specific fevers, acute infective processes, chronic circulatory disturbances consequent upon cardiac, pulmonary, renal and hepatic disease, syphilis, anaemia, chlorosis, diabetes, etc.

Only-Child-Sterility.

Until recently, only-child-sterility had received attention in England only, for the reason that it is comparatively common in that country; but this form of relative sterility is by no means rare with us (in Germany and Austria) also. I had a collection made in Austria of the number of children resulting from 2000 fruitful unions, and found that among these there were 105 marriages in which one child only had been born; thus the ratio of these marriages to those which proved fully fruitful was about 1:19. But the figures are untrustworthy, since abortions and deaths in infancy were not taken into account. *Ansell* found that in England, among

1767 fruitful marriages in which the mean age of the wives at marriage had been 25, there were 131 cases of only-child-sterility, giving a ratio of the latter to the fully fruitful unions of 1:13.

This form of relative sterility, in which the wife gives birth to one child, and thereafter remains barren, was referred by *Matthews Duncan*, either to a premature exhaustion of the reproductive capacity, the generally bodily powers remaining unaffected, or else to a simultaneous weakening of the sexual powers and of the constitutional force in general. This explanation is a very inadequate one. The significant fact upon which an understanding of the nature of only-child-sterility must be based, is that the first delivery is the one which entails the greatest dangers to the mother, and that the subsequent sterility is attributable to the difficult delivery, and to the illnesses that follow in its train. In fact, only-child-sterility is observed chiefly after difficult deliveries, followed by long enduring inflammatory processes of the uterus and the uterine annexa, which seriously affect the woman's reproductive capacity. It occurs especially in delicately organized, anaemic, scrofulous women, whose powers of resistance have been undermined by a single pregnancy and parturition. Finally, it is met with in women suffering from myoma uteri, a form of tumour which beyond others renders the recurrence of pregnancy difficult and unlikely. This form of sterility has been seen also in cases in which comparatively soon after the birth of her first child, the mother has suffered from typhoid, scarlatina, or some other severe infective fever, which appears in some way to interfere for the future with the development of normal ova. We must also take into consideration the fact that at the time of the wife's first confinement, when the love which brought about the union has often already begun to diminish in intensity, the husband, finding too irksome the continence enforced upon him by his wife's condition, is not unlikely to go elsewhere for temporary sexual gratification, and to acquire a venereal disease, which he subsequently transmits to his wife, and which is responsible for the latter's future sterility. And we must not forget to take into account the adoption of means for the prevention of pregnancy after the first child has been born. Again, I saw three cases of only-child-sterility in which the husbands were respectively 24, 26, and 29 years older than their wives, and in these instances no profound search was needful for the discovery of the cause of the wife's unfruitfulness; it was obvious that in each case the elderly husband's reproductive powers had sufficed for the procreation of a single child, but had then been completely exhausted. My experience in the mysteries of sterility in women has informed me of yet another cause of only-child-sterility, met with in cases in which the only child was born after several years of unsuccessful marital inter-

course. In most of these cases, the wife has finally been impelled to seek a substitute for her husband, whose reproductive powers have proved insufficient; having succeeded in obtaining the child she desires, the wife does not again wander in strange pastures, and consequently remains sterile.

According to *Kleinwächter*—who gives a somewhat wider significance to the term “only-child-sterility,” including as he does cases of premature interruption of the first and only pregnancy, since these even more frequently entail permanent sterilization—only-child-sterility is by no means rare. Among 1081 gynecological cases, he observed it in 90, that is, in 8.32% of the cases. In these 90 cases, there were 69 instances in which the sterility ensued upon full term delivery, and 21 instances in which it followed abortion or premature delivery. *Kleinwächter*, moreover, on the basis of his personal experience, supports my view of the importance of the sterilizing influence of the first delivery; but he has been unable to determine whether early marriage has any influence in the production of only-child-sterility.

Lier and *Ascher* also class as instances of only-child-sterility those cases in which a woman has had a single miscarriage, and subsequently remained sterile, since by this miscarriage the capacity of the woman for impregnation has been proved, and the question of capacity for full-term delivery has nothing to do with that of capacity for conception. As causes of this form of sterility, they lay especial stress upon puerperal infection, gonorrhoeal infection, perimetritis, tubo-ovarian tumours, etc.

Operative Sterility.

Finally, in order to complete the etiologically classified series of forms of sterility, we must allude to yet another variety of sterility which is due to the surgical direction of modern gynecology, viz., operative sterility. However much we may prize the gains we owe to modern operative gynecology, it cannot be denied that the new developments have brought many evils in their train. Not the least of these is operative sterility, due to operative procedures involving the female reproductive organs, by which, whether intentionally or unintentionally the reproductive capacity is destroyed. Doubtless, in certain severe organic diseases of the female reproductive apparatus, in which the use of the knife is indicated, the fact that by operating we are sterilizing the patient cannot even be taken into consideration; but many sins have been committed in this kind, and with a ready hand, and, be it openly admitted, with an easy conscience, many an eager operator has undertaken the destruction of a woman's potentialities for motherhood, without having given the

careful consideration that is demanded by the irreparable character of his undertaking. Happily, however, the time has nearly passed away, in which it could be said of many a gynecologist, that no ovaries and no Fallopian tubes were safe from his operative zeal, and from his desire to heap up a mountain of statistics.

Three operative measures very commonly undertaken at the present day are responsible for the production of operative sterility: ovariectomy, oophorectomy, and salpingotomy.

The removal of the ovaries, with the object of permitting to the women concerned unbridled sexual indulgence without risk of consequences, was performed, according to *Strabo*, by the ancient Egyptians and Lydians. The same practice is described by modern writers as occurring in Hindostan (*Roberts*), and in Australia (*Miklucho-Mackay*).

With a curative aim, the removal of the ovaries was first undertaken in the early years of the nineteenth century, although the operation had already been discussed as a possibility by leading physicians of the eighteenth century. The first ovariectomy for the removal of an ovarian tumour was performed by *MacDowell* in the year 1809. During the last three or four decades, the operation has become an extremely common one, and is performed by the surgeons of all nations. Removal of a single ovary, as long as the other ovary is healthy, does not necessarily lead to any impairment of fertility; but when both ovaries are removed, operative sterility is the necessary result. In order to avoid this, *Schröder* has recommended that a fragment, at least, of healthy ovarian tissue should be left behind, in order to preserve the reproductive capacity. In discussing the subject of impaired ovulation, we have already mentioned cases in which pregnancy has occurred after bilateral removal of the ovaries, a circumstance explicable only on one of two assumptions, either that a fragment ovarian tissue was left behind, or else that a supernumary ovary existed.

The extirpation of healthy ovaries, or at any rate, of ovaries which are not notably enlarged, is known as oophorectomy (spaying, *Battey's* operation, in Germany, castration). It dates from the year 1869 (*Koeberlé*); but in the strictly modern sense the operation was first performed by *Hegar* in the year 1872. [*Lawson Tait* removed both ovaries for pain in October, 1871. *Battey's* first operation of this kind was successfully performed on August 17th, 1872; this was three weeks subsequent to the first performance of the operation by *Hegar* of Freiburg. But *Hegar's* patient died from the operation, and *Hegar* did not publish the case at the time—Transl.] The aim of ovariectomy is to remove an ovarian cystoma; if the other, apparently healthy, ovary is removed, it is with the object of removing an ovarian tumour in the initial stage. Oopho-

rectomy has an altogether different purpose, namely, to relieve or cure pathological manifestations in other organs which are believed to depend on the periodical recurrence of ovulation, to cure them by instituting a premature menopause. At one period, when over-zealous operators performed oophorectomy for the supposed relief of comparatively unimportant nervous affections, and the statistics of the operation began to assume gigantic proportions, operative sterility actually came to play no inconspicuous part on the stage of sterility in general. But a reaction inevitably followed; severe diseases were alone considered as furnishing sufficient indications for the operation; of late it has been performed chiefly in cases in which the primary disorder has already rendered the occurrence of pregnancy impossible, or at any rate very unlikely, or, finally, if probable, yet to be avoided, on account of the dangers it would entail. In short, the fertility of women is no longer seriously threatened by this operation.

Some years ago, I was consulted by a beautiful married woman, 26 years of age, of a blooming and healthy aspect. When a young girl, she had suffered every month at the time of the menstrual flow from violent vomiting, accompanied by various spasmodic troubles. Just at this time, oophorectomy was the fashionable operation for the relief of nervous troubles; this girl was subjected to the operation, and the vomiting at the periods ceased, but the other nervous symptoms persisted without alleviation—indeed were at times worse than before. Since then, she had married a man belonging to the upper circles of society; and now, after living for four years in sterile wedlock, she came to me to ask my advice as to whether anything could be done to enable her to have a child! Two other cases have come within my own knowledge, in which women whose ovaries had been removed on account of nervous troubles, had subsequently married, and felt most unhappy owing to their hopeless state of sterility.

It is impossible to make even an approximate estimate of the number of women who in recent years have had their ovaries removed during the period of sexual maturity, and who have thus been made the subjects of operative sterility; nor is it possible to ascertain in what proportion of cases the healthy ovaries, the normal female reproductive glands, have been removed for the problematical relief of nervous troubles or of uterine hæmorrhage, and in what proportion of cases there has existed a genuine indication, owing to the presence of fibromyoma of the uterus, for the induction of an artificial and premature menopause. Unquestionably, the number of women thus operated on during the menacme is by no means a small one. In a work by *Hermes*, "On the Results of Oophorectomy in Cases of Myoma of the Uterus," *Archiv für Gynecologie*,

1894, we find that, among 55 women whose ovaries were removed on account of myoma of the uterus, there were 52 who were between the ages of 21 and 45, i. e., in the period of sexual maturity. The assumption that all these patients were already sterile before the operation, on account of a degenerate condition of the uterine annexa, cannot be justified.

Keppler, indeed, puts forward a very remarkable defence of the removal of the ovaries of women who are competent to become mothers, asserting that such oophorectomy offers no obstacle to marriage, and that many women who have been operated on in this manner are extremely happy in conjugal life. Marriage with a wife whose ovaries have been removed is the ideal Malthusian marriage, the one way in which Malthusianism can be practised without endangering the health and life-happiness of the participants!

Another danger soon appeared, one which threatened the fertility of women to an even greater extent, in the form of operations on the uterine annexa—the first salpingotomy was performed by *Hegar* in 1877. As knowledge advanced of the various diseases of the Fallopian tubes, salpingitis, hydrosalpinx, and pyosalpinx, whilst at the same time the development of the antiseptic method rendered operative gynecology continually bolder and bolder in its undertakings, there was disclosed an extensive field for radical measures in removal of the tubes, generally combined with removal of the ovaries, since these latter organs commonly were found to have suffered from association in the destructive inflammatory process. The operation of salpingo-oophorectomy soon became a very common one; and since patients with diseased tubes are for the most part still comparatively young, in the period of sexual maturity, there arose a new and frequent variety of operative sterility, and one which the zeal of American gynecologists made especially common on the other side of the Atlantic. An American gynecologist, indeed, has sarcastically observed that “It is the dish-full of excised tubes that shows the master gynecologist”; and *Landau* has been impelled to lament that “salpingotomy has been performed on a very large number of women who have complained of nothing more serious than uterine haemorrhages, or of insignificant pains, and even on some women who have come to the gynecologist with no other complaint than that—they are sterile”! *Fritsch*, also, writing of the too rapidly formed diagnosis “tumor of the annexa,” and the consequent resort to operation, remarks: “I know many a happy mother who at one time had worn every variety of pessary, had been through every kind of ‘cure,’ and had visited every accessible spa; until, at last, she came to consult me, with the express wish to have her ovaries removed. Latterly, she had been advised to this

course by every physician she had consulted. I agreed, in such cases, to perform the operation, with the stipulation that first of all, for the space of an entire year, the patient should not see a single doctor, should visit no spa, should take no medicine, and, in short, should pay no attention whatever to her health. The success of this course of 'treatment' was often extraordinary. As soon as the reproductive organs were left in peace, recovery ensued." The conservative tendencies of the surgery of the last decade, have manifested themselves also in the department of gynecology, for the happy protection of woman and her reproductive capacity. Operative measures are now commonly restricted to the relief of certain severe forms of disease of the uterine annexa; in cases of chronic inflammation of the annexa, the surgeon often contents himself with dividing or breaking down the adhesions, and leaves the organs in situ; even in cases of bilateral disease, one tube only may be removed; whilst in the most recent method of all, after opening the abdomen, and separating the pelvic organs from their adhesions, an aperture is made in the closed tube, and this artificial ostium is brought into apposition with the ovary by the insertion of sutures. In a word, surgeons have come to realize that they have in the past been too ready to sterilize their patients by the performance of double salpingo-oophorectomy, and are much more reluctant than formerly to sacrifice the ovaries and the Fallopian tubes.

Porro's operation is another cause of operative sterility, excision of the ovaries being combined with the partial excision of the uterus, whereas sterility was seldom the consequence of the older method of Caesarian section. Indeed, *Porro's* operation has been extolled precisely on this account, that, indicated as it is for the relief of extremely difficult labour, it renders it impossible for the same difficulty and danger ever to recur.

The classical operation of Caesarian section, if the patient makes a favourable recovery, does not involve sterility, unless in very exceptional cases (as in one described by *Lecluyse*, in which, after the Caesarian section, a communication persisted between the uterine cavity and the cavity of the abdomen, through which the semen passed during coitus). Occasionally, also, in performing the older operation, the operator has thought it right to prevent the future recurrence of pregnancy by adding an oophorectomy to the primary operation.

Pregnancy and parturition are still possible after the healing of spontaneous or traumatic ruptures of the uterus; but it must be remembered that after such serious injuries, as after extensive operative procedures on the pelvic organs, widespread peritoneal inflammation is apt to occur, with perimetritic and parametritic exudations, leading commonly to sterility.

Amputation of the vaginal portion of the cervix, an operation sometimes undertaken for the relief of sterility in cases of hypertrophy of the cervix, may on the other hand lead to sterility in cases in which a cicatricial stenosis of the cervical canal results from the operation.

By the too frequent application of caustics to the cervical canal, or by the employment of these agents in too powerful a form, occlusion of the os externum may be caused, or even adhesion of the opposing walls of the vagina just below the cervix, thus giving rise to sterility. Rough use, also, of the uterine sound, and maladroit and violent gynecological massage, have often enough been responsible for the occurrence of sterility, by giving rise to perimetritic inflammation. *Landau* enumerates among the causes of intra-pelvic abscesses, "whereby the specific functions of womanhood are nullified in consequence of degeneration of the tubes or the ovaries," "certain therapeutic procedures," and more especially, intra-uterine therapy, (the use of the sound, curettage, injections, cauterization), and operations on the cervix or the vagina, on which intra-pelvic inflammation and even suppuration has ensued. How easily pelvic peritonitis and its consequences lead to sterility in women, has been shown many times in the course of our exposition of this subject.

Finally, we must class with operative sterility the result of surgical procedure undertaken by gynecologists to save women, whose lives have already been seriously threatened by pregnancy or parturition, from a repetition of this experience. In such cases, *Blundell* recommends division of the Fallopian tubes, having found from experiments upon rabbits that this is a safe and certain means for the prevention of conception. *Frorieps* and *Kocks* have both frequently brought about an artificial sterility in women by closure of the tubes, the first-named by cauterization with nitrate of silver — the caustic being attached to the end of a piece of whalebone and introduced through a canula into the uterine orifice of the Fallopian tube — whilst *Kocks* has constructed for the same purpose a galvano-caustic uterine sound, which is only rendered red-hot by passage of the current after it has been introduced into the uterine ostium of the tube. Both these methods are in the first place too uncertain to be relied upon for the attainment of the desired end, and in the second place their employment appears to be neither easy, nor free from danger.

As the importance of conservative methods of procedure becomes once more fully recognized in modern gynecology, cases of operative sterility will become ever more and more rare.

TABLE SHOWING THE CAUSES OF STERILITY IN WOMEN.

I. STERILITY DUE TO INCAPACITY FOR OVULATION.

ABSOLUTE AND IRREMEDIALE.

Complete absence of the ovaries.
 Congenital atrophy of both ovaries.
 Premature atrophy of the ovaries, in consequence of infectious disorders, constitutional diseases, and toxic influences.
 New-growths of the ovaries, destroying *all* the follicles.
 Senile changes in the ovaries.
 Complete oophorectomy, or any equivalent form of operative sterility.

RELATIVE AND TRANSIENT.

Incomplete development of the ovaries.
 Imperfect formation of ova, owing to marriage when still too young (amenorrhoea).
 Ovarian tumours and oophorectomy, whereby, however, a remnant of *healthy* ovarian tissue is spared.
 Chronic oophoritis and perioophoritis; syphilitic disease of the ovaries.
 Excessive obesity, anaemia, chlorosis, scrofula, morphinism, alcoholism, various conditions affecting unfavourably the innervation or nutrition of the ovary change of climate or mode of life; emotional disturbance; inbreeding, hereditary predisposition.

II. STERILITY DUE TO INTERFERENCE WITH THE CONTACT OF NORMAL SPERMATOZOON AND OVUM.

A. On the Part of the Wife.

ABSOLUTE AND IRREMEDIALE.

Congenital or acquired universal thickening of the tunica albuginea of the ovaries, preventing the dehiscence of the follicles.
 Absence of both tubes, developmental defects of these organs.
 Absence or rudimentary condition of the uterus. Foetal uterus.
 Congenital atresia of the uterus with arrest of development.
 Complete absence of the vagina.
 Extreme contraction of the pelvis, whereby the vagina is rendered inaccessible.
 Hermaphroditism.

RELATIVE AND TRANSIENT

Remediable thickening of the tunica albuginea, inflammatory remnants of perioophoritic processes, diseases of the cervical glands, dislocations and adhesions of the tubes, narrowing or obliteration of the ostia, inflammation of the tubes, pyosalpinx, obliteration of the lumen of the tube.
 Retrouterine haematocoele.
 New growths in the uterine cavity.
 Infantile and pubescent uterus.
 Primary atrophy of the uterus.
 Puerperal atrophy of the uterus.
 Displacements of the uterus — versions and flexions.
 Hypertrophy or atrophy or changes in the shape of the cervix, cervical stenosis.
 Cervical catarrh, especially when gonorrhoeal.
 Ectropium of the cervix.
 Spasmodic dysmenorrhoea.
 Atresia of the vagina, obliteration of the canal by scars or tumours.
 Abnormal termination of the vagina — vesico-vaginal and recto-vaginal fistula.

ABSOLUTE AND IRREMIABLE.**RELATIVE AND TRANSIENT.**

Absence of the external organs of generation and partial absence of the vagina, without defect of the internal organs of generation.
 Abnormalities of the hymen.
 Pathological states of the genital secretions.
 Vaginismus.
 Dyspareunia.
 Perversion of the sexual impulse.

*B. On the Part of the Husband.***ABSOLUTE AND IRREMIABLE.****RELATIVE AND TRANSIENT.**

Diseases of the central nervous system, and certain constitutional diseases.
 Congenital or acquired absence of both testicles.
 Atrophy of the testicles.
 Complete azoospermia and aspermatism.
 Senile impotence.

Developmental defects of the penis, and acquired deformities of that organ.
 Stricture of the urethra.
 Oligozoospermia.
 Nervous impotence.
 Gonorrhoeal and syphilitic infection.
 The employment of measures for the prevention of pregnancy (facultative sterility).

III. STERILITY DUE TO INCAPACITY FOR THE IMPLANTATION AND FURTHER DEVELOPMENT OF THE OVUM.

ABSOLUTE AND IRREMIABLE.**RELATIVE AND TRANSIENT.**

Arrested development of the uterus.
 Complete atrophy of the uterine mucous membrane.

Chronic metritis.
 Chronic endometritis, especially gonorrhoeal and exfoliative endometritis.
 Perimetritis, parametritis, pelvic peritonitis; the consequences of these inflammations.
 Tumours of the uterus.
 Displacements of the uterus.

III. SEXUAL EPOCH OF THE MENOPAUSE.

THE MENOPAUSE.

That time in a woman's life at which her sexual activities come to their natural termination, marked by the cessation of menstruation, is known as the menopause, climax, or climacteric period.

This "change of life," from a condition of sexual maturity to a condition of quiescence of sexual functions, is not a sudden one, the symptoms of sexual retrogression making their appearance gradually, until the cessation of the monthly recurring menstrual flow indicates that the termination of sexual activity has arrived, and that sexual death is taking place.

The influence of this period of life is not manifested by the sexual organs alone—in these latter indeed various changes may be detected already before the cessation of menstruation, whilst after that cessation, the atrophic changes characteristic of old age proceed in these organs with a slow but continuous advance,—but the disturbances evoked by the climacteric involve the entire organism and affect the functions of numerous organs, giving rise to a true storm of irritant phenomena, and to manifestations of decay of manifold nature.

The stormy manifestations, the occurrence of which led the ancients to denote this period as the "critical age" of a woman's life, are in the first place due to changes in the ovaries; the tissue changes in these organs give rise to a powerful ovarian stimulus, which, by irradiation and reflex action, leads to the occurrence of a number of nervous disturbances, vaso-motor manifestations, and circulatory disorders; whilst owing to the cessation of the internal secretions of the ovaries, numerous and intense pathological disorders of metabolism arise. These various symptoms become apparent at the very outset of the menopause, when the oncoming entire cessation of menstruation is already foreshadowed by irregularity in the periods, gradual diminution in the quantity of the flow, and variations in the number of days during which the flow on each occasion persists.

The manifestations of the menopause are in fact so striking, that from ancient times down to the present day a widespread belief has prevailed that especial danger to a woman's life is threatened by

the climacteric age. The statistics available on this subject are, however, of dubious significance. Although it cannot be denied that the changes in the entire organism which attend the extinction of sexual activity, bring numerous dangerous influences into play, yet I feel bound to maintain that these dangers are by no means so great as those which are involved by the sexual life in its ripest period of development—the dangers of pregnancy, parturition, and the puerperium.

It is often asserted that in this "critical period" of the menopause, the mortality of the female sex is notably increased. The data available are somewhat conflicting, but a careful examination leads us to believe that, if due allowance is made for the natural increase in mortality with advancing years, no important increase in the mortality of women can be traced as due to the troubles and disturbances of the climacteric period.

The age at which a woman's last sexual epoch begins is a very variable one. The duration of the "change of life," the length of time during which the occurrence of the "change" is manifested by local and general disturbances, also varies greatly. Not less variable are the intensity and the general distribution of the symptoms which mark the climacteric.

The external configuration of woman at the climacteric age is usually characterized by signs of over-ripeness, and these changes appear to exercise upon certain men—more especially very young men—a peculiar kind of erotic stimulus. Many women remain long at this period quite fresh looking, with a vivid, youthful colouring; others, however, early manifest alterations in their finer feminine characteristics, hairs, for instance sprouting on the chin, and the voice becoming deeper in tone.

The outward characters of senescence, with withering of the tissues, are not commonly manifested at this time, but first make their appearance in later years, after the completion of the menopause.

A tendency to the excessive accumulation of fatty tissue is one of the most distinctive characteristics of the menopause, varying, however, greatly in degree according to race, family predisposition, and nutritive conditions. The dominant tone is thus given to the physical configuration by the deposit of fat. The face comes to have a rounded, spherical appearance, the eyes, looking smaller in proportion, whilst the furrows and folds which form the natural boundaries between the features become indistinct. The formation of the "double chin," and the abundant deposit of fatty tissue in the supraclavicular region, gives to these extremely obese women an appearance of such a shortening of the neck, that head and thorax seem to be connected as it were by a great mass of fat,

marked by furrows in the thyroid and sub-hyoid regions. The breasts sometimes attain an enormous size, hanging down to the gastric and even to the umbilical region. The abdomen is greatly enlarged, the fat in the anterior abdominal wall projecting more especially in the hypogastric region, hanging down in two or three horizontal rolls over the tops of the thighs, and pushing the mons veneris downwards, so that this latter itself projects over the genital fissure. The posterior projection of the buttocks is also greatly increased, until they form a huge elastic cushion, of which the sensual orientals, who regard obesity in women as a beauty, poetically write: "Her face is like the full moon, and her buttocks are like two pillows." Occasionally, so huge a mass of fat forms beneath the tuberosity of the ischium, that the configuration of the nates reminds us of the well-known *steatopyga* or fat-rump of the Hottentot and Bosjesman women. In the genital organs, as already mentioned, the genital fissure is hidden by the projection of the mons veneris. The labia majora are also greatly enlarged by the deposit of fat, so that they look like two great cylinders lying side by side. Another way in which the characteristic sexual beauty is often lost in extremely obese women, is by the falling out of the pubic hair.

Moreau, in his work on *The Natural History of Woman*, describes the changes occurring in a woman at the climacteric in similar terms, and concludes: "The only elements of a woman's beauty that may sometimes be saved from the wreck, to persist for a shorter or longer time after the climacteric, are, the abundance of her hair, the vivacity of her glance, and sometimes also the amiable expression of her countenance; gradually, however, even these last remnants of beauty disappear, and old age takes possession with its irresistible force."

None the less, some women may preserve substantial elements of beauty for a long time after the menopause. A classical example of this fact is furnished by *Ninon de l'Enclos*. When she died, at the age of 90, she was still beautiful. At the age of 65 she aroused the passionate love of a young man, who, unfortunately, was her own son. When informed of this, he committed suicide. A young abbé fell in love with her when she was 75 years old.

The psychical life of woman is profoundly affected by the stormy physical changes of the climacteric. Not merely does a woman entertain the disturbing thought that the critical age has begun, bringing in its train certain dreaded dangers to her health and even her life, but she is further depressed by the consciousness that she is about to lose her feminine attractions, and to decline in sexual esteem, and that her reproductive capacity is now to be extinguished. She realizes vividly that the beautiful past, the loving and beloved

womanhood, is now to be left behind for ever, and by this an intelligent and sensitive woman cannot fail to be profoundly affected. Her feelings at this time were never more characteristically expressed than by the Frenchwoman who said "*Autrefois quand j'étais femme.*" If, indeed, a woman has been so fortunate as to have made a happy marriage, to have borne healthy children, and to be living a satisfactory family life, she will be enabled to bear with comparative equanimity the disappearance of her sexual life; but it is different with the childless wife and with the unmarried woman, who, at the onset of the climacteric, must bury all their sexual aspirations, and who see the remainder of their lives stretch before them without hopes for the future. The psychical predisposition and the intellectual education of the woman concerned, will now determine whether she will bear the onset of the menopause with composure and resignation, or whether she will become a prey to melancholia. Women of the former kind will seek to find employment for the powers set free by their sexual non-activity, in services of neighbourly affection, in works of benevolence, and in the performance of social duties; women less happily endowed will display their hostility to the world in ill-nature, scandal-mongering, and intrigue, thus giving vent to their inward bitterness; whilst those, finally, with hereditary predisposition to nervous degeneration, will become the prey of veritable psychoses.

A by no means rare result of the excited fantasy and of the eager desire not to grow old, is displayed at the climacteric in the form of self-deception. The women thus affected cannot understand, and cannot be made to believe, that the cessation of menstruation is the natural sign of their sexual decadence, they trick themselves into believing that in their case it is a sign that they have become pregnant. We must not indeed forget that the enlargement of the abdomen, so common at the commencement of the climacteric, in association with the unexpected failure of the menstrual flow to appear, the frequent dyspeptic troubles, and the enlargement of the breasts in consequence of the deposit of fat in these organs, often enough lead to appearance which have a deceptive resemblance to the clinical picture of early pregnancy. The mistake is the more readily made because the breasts sometimes secrete a serous fluid, whilst saccharine is not infrequent, and peristaltic movements of the intestines are mistaken for the movements of the foetus. Cases of this kind, in which all the objective signs of pregnancy appear to be present, and in which it is impossible to convince the woman that she has been deceiving herself, and that all the signs and symptoms are due to the menopause, are mentioned already by very early writers, and have been frequently reported by modern gynecologists.

(An example of spurious pregnancy especially familiar to English readers is that of Mary I, Queen of England. Transl.)

Sexual desire in woman by no means reaches its physiological term with the climacteric and the cessation of menstruation. On the contrary, we have observed it to be the rule that shortly before and at the commencement of the climacteric, there is a considerable increase in the libido sexualis, and at the same time an increase in sexual sensibility during coitus. This sexual erethism makes its appearance in a manner often extremely surprising to the husband — and especially surprising in the case of women who have previously been characterized by a certain frigidity in sexual matters, and who have, perhaps, always needed strong persuasion before they would consent to perform their marital duties. It is by no means rare for the increased sexual impulse to manifest itself in some pathological form. Even some time after the menopause, when senile changes in the genital organs are far advanced, the sexual impulse may still be remarkably active. There is an interesting analogy in the fact that *Glaevecke* observed that the sexual impulse was persistent in women in whom an artificial menopause had been induced by oophorectomy; and that *Lawson Tait* and *L. Smith* have reported cases in which dyspareunia, which had existed prior to the operation, passed away after the removal of the ovaries, so that after the artificial menopause, voluptas coeundi for the first time made its appearance. Other authors, *Goodell*, for instance, report that libido sexualis is retained only for a short time after oophorectomy, but subsequently disappears, as in the course of the physiological menopause, and that at the same time the voluptas coeundi is entirely extinguished.

When the menopause is fully established, and the processes of involution in the reproductive organs have taken place in a normal manner, the woman has had time to acquiesce in the inevitableness of the changes that have occurred, and she often attains a state of emotional repose which was quite unknown to her in the earlier phases of her sexual life. More particularly, those women who hitherto during menstruation, and for some days before and after the flow, have been the prey of numerous nervous symptoms and troubles, rejoice, after the menopause, at their new-won freedom from these pains and disquiets, at their delivery from the excitements of the reproductive system, at their now uninterrupted state of well-being.

I once saw a group of statuary by *Pietro Balestra*, entitled "Time carries off Beauty." A beautiful woman was striving in vain to resist the overwhelming might of Chronos, whilst Cupid, about to be abandoned, was standing sorrowfully by. Here we have a symbolic representation of the sexual epoch of the menopause.

In a recently published romance, "*Les Demi-Vieilles*," Yvette Guilbert has described in a manner most true to nature the feelings of the "Half-Old," the mental condition of women at the climacteric, "They endeavour to remain young, to hide their defects, they seek once again the intoxication of love. But that which aforesaid in hours of depression they have foreseen, now becomes a dreadful reality. When the lemon has been squeezed dry, the skin is thrown away."

Sooner or later after the completion of the menopause, the signs of senile marasmus become apparent. The soft, feminine configuration of the face disappears, the features become coarser, approaching the masculine type, hairs appear on the upper lip and on the chin. The voice becomes deeper and harsher. As decrepitude begins, the breasts wither, a change that occurs sooner in proportion to the degree in which their functions have been in previous years exercised by suckling; but also sometimes after a life of complete sexual inactivity. Even in cases in which the loss of substance of the breasts is apparently small, the glandular tissue of the organs has really disappeared, and has been replaced by fat. In advanced age, the breasts become quite small, wrinkled, flaccid, and dependent, and sometimes atrophied to become mere cutaneous folds. The nipples project more prominently, they are darker in colour, and their surface is wrinkled. In the genital organs, the fat disappears from the mons veneris, which becomes flattened, whilst the pubic hair ceases to be curly, and much or all of it is ultimately shed. The labia majora become thin and flaccid, until they are mere empty folds of skin; they are widely separated, so that the vaginal orifice is closed only by the withered nymphae, until these latter are themselves ultimately indicated by mere traces.

Where the menopause has been artificially induced, the signs of senescence do not appear immediately after the removal of the ovaries; their development is a very gradual one. The sexually mature woman, from whom these tokens of femininity have been removed, experiences at first little change in external configuration, beyond a somewhat exaggerated tendency to the deposit of fat; the other changes described do not usually set in until the physiological climacteric age is attained. A few cases only have been observed in which after oophorectomy a rapid change to the masculine configuration has been observed.

Seldom if ever does it happen that menstruation suddenly ceases without any notable constitutional disturbance, so that in a moment, as it were, the menopause is effected, without any period of transition. Rarely, even, do we meet with cases in which the peculiar manifestations foreshadowing or accompanying the cessation of menstruation last for no more than a few weeks. Most commonly

the irregularities of the menstrual function (of which the most noteworthy characteristic has hitherto been its extreme regularity), and the associated symptoms of the climacteric period, endure for months, and occasionally for years. According to my own observations, the mean duration of the climacteric manifestations is from two to three years, the limits of variation in individual cases being, however, exceedingly wide.

The manifestations which accompany the cessation of menstruation are as a rule the following: The woman is for some months in an irritable condition, complains of digestive disturbances, constipation, meteorism, epistaxis, hæmorrhoidal flux, congestions of the head, increasing fugitive sensations of heat (Ger. *fliegende Hitze*), and a tendency to profuse perspiration.

The length of the intermenstrual interval commonly increases, to as much as six or eight weeks; the flow itself becomes scantier. In other cases, however, the flow becomes much more abundant, and the intermenstrual intervals much shorter than normal. In some cases, the regularity of the flow is altogether lost, it appears now soon, now late, and is now scanty, now profuse. Sometimes the intervals are several months, it may be 6, 8, and even 10 months, then again the flow will occur every two or three weeks; in exceptional cases, a scanty flow persists right through what should be the interval, so that menstruation becomes continuous, with periodic increases in the flow. Not infrequently, after a sudden cessation of the flow lasting for many months, menstruation recurs, and continues at regular intervals for a long time, until the final cessation of menstrual activity.

The mode of cessation which is most favourable to a woman's general health, is for the duration of the intermenstrual interval gradually to increase, whilst *pari passu* with this increase, the amount of the flow progressively decreases, until it ceases altogether. In such cases, the general constitutional disturbance is reduced to a minimum. On the other hand, the *sudden* cessation of menstruation gives rise to profound disturbance of the domestic economy of the feminine organism, and causes violent changes therein. But even the gradual cessation of menstruation causes notable disturbance of the woman's mental and physical equilibrium, if the irregularities in the menstrual process are very great and spread over a very long period—more especially when the loss of blood is extensive.

Even after the menopause, after the final termination of the flow, there persists a more or less regular recurrence of certain symptoms referable to the continuance of ovulation. *Sacrache*, a sense of abdominal tension, a feeling of heat and fullness in the pelvis, dragging pain in the hypogastrium, and general irritability, occur at

intervals, so that the woman thus affected sometimes describes herself as suffering from the continuance of a "bloodless menstruation."

Tilt made observations in 637 women, in order to ascertain the various modes in which the menopause occurs, and obtained the following results. The menopause occurred:

By gradual diminution of the amount of the flow	in 171 women, or 26.84 per cent.
By sudden interruption of the flow.....	in 94 women, or 14.76 per cent.
By sudden interruption and a terminal attack of metrorrhagia	in 43 women, or 6.75 per cent.
By a terminal attack of metrorrhagia....	in 82 women, or 12.87 per cent.
By a series of attacks of metrorrhagia...	in 56 women, or 8.79 per cent.
By alternations of very profuse and very scanty menstruation	in 36 women, or 5.65 per cent.
By irregular recurrence of menstruation, at intervals exceeding 21 days.....	in 99 women, or 15.54 per cent.
By irregular recurrence of menstruation, at intervals of less than 21 days.....	in 33 women, or 5.18 per cent.
By irregular recurrence of menstruation, the intervals being sometimes longer and sometimes shorter than 21 days....	in 23 women, or 3.61 per cent.
Totals	637 99.99

The two principal dangers of the climacteric period in women are, first, the great tendency to profuse uterine hæmorrhages, and, secondly, the liability to the occurrence of malignant tumours, more especially to carcinomatous disease of the ovaries, the uterus, and the mammae.

With regard to the question whether, in any particular individual, the course of the menopause is likely to be favourable or unfavourable, there are, in my experience, four considerations of principal prognostic significance: the condition of the woman during the menarche, the state of the general health at the time of commencement of the menopause, the degree to which the sexual functions have been and are being exercised, and the manner in which the cessation of menstruation takes place.

As a rule, the disturbances and pathological states of the climacteric period will be especially frequent and severe in women whose sexual development at the time of the menarche was accompanied by severe disturbances of the general condition. In every individual, there appears to be a certain connexion between the manifestations attending the menarche and those attending the menopause, of such a nature that according as puberty has been passed through with little or with much disturbance of the general condition, a similar favourable or unfavourable course of the menopause may be prognosticated. If, at the time of the menarche, there were severe nervous manifestations, or heart troubles of a serious kind,

the passage of the menopause may be expected to give rise to neuropathic affections and to cardiac disturbances in a similar manner.

The woman's state of general health is likewise of importance in determining whether the course of the menopause will be favourable or unfavourable. Perfectly healthy women, with a quiescent temperament, and in favourable circumstances of life, will pass most easily through the climacteric period without disturbance of their general condition. Every departure from normal health has an unfavourable influence upon the course of the climacteric. In women of a plethoric habit of body, there is an especial tendency at this time to the occurrence of symptoms of stasis and hyperaemia. Chlorotic and anaemic women are more prone than others to suffer at the time of the menopause from uterine haemorrhages. Women of a sanguino-erethistic constitutional disposition often manifest at this epoch a tendency to neuroses and psychoses. Those women have the best prospect of a smooth and undisturbed passage through the climacteric age, who enter upon it in a state of perfect health. Less favourable is the prognosis in the case of those women who already some time before the climax, at the outset of the fourth decade of their lives, have begun to complain of severe haemorrhages and various other pathological states.

Regarding the influence which the sexual activity of a woman during the menacme exercises upon the course of the climacteric, it may be said, generally speaking, that a previous free exercise of the sexual functions in normal conditions has a favourable influence upon the state of health during the menopause. Women who have been married for many years, who have had many children, and who have suckled these children, pass through the changes of the climacteric much more easily than old maids, than women who have lived for many years in continent widowhood, or than women who have had very few children or none at all. The practice of prohibitive coitus, i. e., the use during intercourse of methods of preventing the occurrence of conception, a form of sexual immorality which has become extraordinarily common during the last few decades, has an unfavourable influence upon the course of the climacteric. Unfavourable, also, is the effect of great sexual activity during the four or five years immediately preceding the menopause. Women who marry shortly before the commencement of the climacteric, and those who have given birth to a child shortly before this time, commonly experience very severe disturbances during the menopause. Prostitutes who continue the active pursuit of their profession until the climacteric age, have at this time much to suffer. Women who have had difficult deliveries, or several miscarriages, or severe puerperal illnesses — and indeed, speaking gen-

cally, those women who have been subject to any kind of disease of the reproductive organs—are apt to suffer from serious disturbances of the general health during the climacteric period.

The mode in which the cessation of menstruation takes place, is also causally connected with the easy or difficult course of the menopause. Premature cessation of menstruation, or very sudden interruption of this function, has a deleterious effect, manifesting itself both by local disorders of the reproductive organs, and by general disturbances in the nervous system and in the circulatory organs. On the other hand, a late menopause and a gradual cessation of menstruation, are both usually accompanied by a favourable course of the climacteric phenomena.

The influence of sexual activity upon the course of the climacteric is described by *Busch* in the following terms: "Women who have led an exhausting mode of life, who have had intercourse too frequently, those who have been given to onanism or to some other sexual irregularity, and who therefore enter upon the menopause with flaccid and deteriorated reproductive organs, are liable to hæmorrhagic and mucuous fluxes, to prolapse, carcinoma, dropsies, enlargements, and suppurative processes. Women, on the other hand, who have lived a life of strict isolation, and who have forcibly repressed all sexual inclinations, frequently suffer from ossifications, indurations, and atrophic conditions of the reproductive organs, and also from neoplasmata."

After an artificial menopause, induced by the operative removal of the ovaries, similar manifestations occur to those witnessed during the natural menopause. Similar disturbances and troubles occur in both cases, but in the artificial menopause they are commonly more severe than in the natural; they last also for a longer time, varying usually from three to six years; moreover, in the artificial menopause, as in the natural, the disturbance of health is more severe and lasts longer in proportion to the youth of the individual. Further, in the artificial menopause also, the intensity and the duration of the climacteric manifestations are influenced by the constitutional state and by the condition of the genital organs at the time when the operation is performed. We note, moreover, that, just as in the physiological menopause, the attendant troubles are most violent in the initial period, and then gradually subside, so also after the induction of an artificial menopause by the removal of the ovaries, the resultant disturbances rapidly increase in severity, to attain their maximum in from three to six months, and then, after lasting for a year or so, they gradually become less severe, until they are ultimately extinguished.

The extensive process of transformation which goes on in a woman's system during this period of the sexual life, from the very

first diminution in ovarian activity to the complete extinction of the reproductive functions, manifests itself throughout the organism by means of a series of changes which can for the most part be referred either to states of blood-stasis and their consequences—congestion of various organs, haemorrhages, and disorders of secretion—or else to perversions of nervous function.

The most manifold symptoms of disordered circulation may occur: hyperaemic states of the central nervous system, flushings of the face, the so-called fugitive heats (Ger. *fliegende Hitze*), a tendency to epistaxis, to haemorrhoidal flux, and to profuse perspiration. The changes which take place in the reproductive organs at the time of the menopause give rise to venous engorgement and to collateral congestions. Such a condition of venous hyperaemia may occur in the gastric and the intestinal mucous membrane, giving rise to various dyspeptic manifestations, and at times, when severe, even to actual gastric and intestinal catarrh. Hyperaemia of the liver may also arise. In this case, the pressure of the distended blood-vessels on the biliary ducts may interfere with the outflow of the bile, and thus give rise to a slight icterus. Further, the intra-abdominal venous congestion leads to overfilling of the haemorrhoidal veins, and hence to bleeding piles.

When the congestion is long-lasting, various further morbid changes may arise, pulmonary hyperaemia may eventuate in bronchitis, hyperaemia of the cerebral meninges may cause very severe headache, there may be syncopal attacks, tinnitus aurium, choroidal congestion, impaired vision, etc.

Congestion of a more active nature arises from an increased and usually accelerated flow of blood through the vessels of a part in which the resistance to the blood stream has been lowered proportionately to its propulsive force. In this way arises that characteristic symptom of the menopause known as *ardor fugax*—fugitive heat—one link in the long chain of vasomotor manifestations occurring at this period of life. Fugitive heats are commonly most clearly marked in the face, head, and neck, in which region there suddenly occurs a reddening of the skin, with diffuse and increasing subjective sensation of heat. At the same time there is often a sense of tension, as if the part were about to burst. Actual slight swelling may be noticed, the eyes sparkle and are somewhat prominent, the head feels heavy, stupid, and dizzy. Sometimes these symptoms last for a considerable time; at other times they terminate speedily and suddenly with a local perspiration or with an attack of epistaxis. Not infrequently, after lasting a short time in one region, they pass away as rapidly as they came, but are immediately succeeded by a similar attack in some other part of the body, or by vasomotor

phenomena of a slightly different kind. Thus, such a flushing and heat of the face may be replaced by a sudden sense of heat in the small of the back or in the sacral region, by pruritus of the extremities, by palpitation of heart, or by an attack of pseud-angina.

A further consequence of active hyperaemia is the onset of those confused states, so common in the climacteric age, of mental and bodily disquiet, which find expression, now in states of excitement, and now in states of depression. So we often observe change of disposition, associated with incapacity for regular work, whilst sleep is restless, and much disturbed by dreams; and again states of dizziness, a sense of mental uneasiness and confusion, and even actual delirium.

In the skin, in addition to the fugitive heats, we often have a peculiar pricking, itching, or stabbing sensation, and various kinds of hyperaesthesia, frequently associated with disturbances of tactile sensation. We observe also muscular twitchings, and general weakness of the organs of locomotion.

In association with the passive and active hyperaemias of the menopause, we frequently see increase or some qualitative change in the various secretions. Above all, these changes affect the various secretions of the different reproductive organs, but we have also increased intestinal secretion, leading to diarrhoea, increased excretion of urinary deposits, and increased secretion by the skin. Symptoms which are common at the menarche, and frequently recurs at the menopause, are: headache, migraine, a state of pseudo-narcotism, slight hysterical attacks, indications of moral insanity, lumbo-abdominal neuralgias, neuralgia of the breasts, leucorrhoea, and various skin eruptions.

According to *Tilt*, the changes occurring in the organism at the climacteric period may be summarized under the following heads:

1. Increased elimination of carbonic acid by the lungs,
2. Increased elimination of uric acid in the urine,
3. Increased perspiration,
4. Increased mucous flux,
5. Haemorrhages from various organs.

As regards the first point, the extensive researches of *Andral* and *Gavaret* have shown that in the female sex the quantity of carbonic acid eliminated by the lungs diminishes when menstruation first appears at puberty, but increases again at the climacteric age, when menstruation ceases — whereas in the male a gradual diminution in the elimination of carbonic acid begins already in the 36th year of life; in old age the quantity eliminated is greatly reduced in both sexes alike.

CHANGES IN THE FEMALE REPRODUCTIVE ORGANS AT THE MENOPAUSE.

In considering the changes that take place in the female reproductive organs at this period of life, we must distinguish between

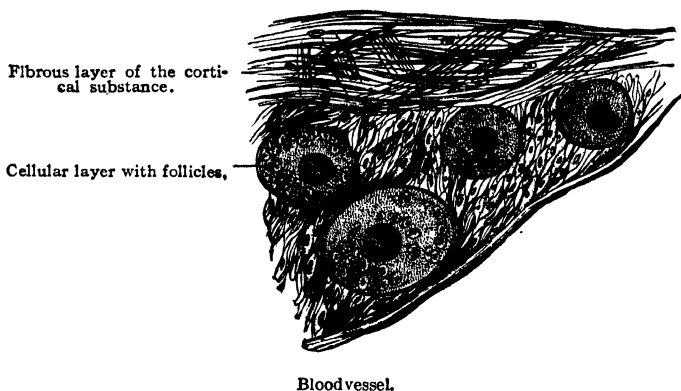


FIG. 84.—Sagittal section through the ovary of a girl aged 16.

the proper period of the *climacteric*, with its various manifestations antecedent to and associated with the irregularity and ultimate cessation of menstruation, from the condition of *old age* in which menstruation has actually and completely ceased, in which the menopause has been fully accomplished, and in which the changes of senescence have set in at once in the organs of the reproductive system and in the organism as a whole.

The most important and most significant changes of this sexual epoch are unquestionably the anatomical alterations in the ovaries. A good many years ago I undertook an investigation whose purpose was to follow the natural involution of the graafian follicles from the time of the climax on into old age, and for this purpose I examined a very large number of ovaries of women at ages varying from 42 to 75 years (*Archiv. für Gynecologie*, Bd, XII., Heft 3).

Throughout these years a slow but continuously progressive atrophy proceeds in the ovaries; they become smaller and denser, diminishing especially in height and width; their surface becomes extremely uneven; and in extreme old age they wither away until no more is left in the region formerly occupied by the ovaries than a flattened fibro-vascular thickening (Figs. 84–88). The histological characteristic of the changes in the ovary which proceed

gradually from the commencement of the menopause to extreme old age, may be summed up as consisting in a continual increase and new formation of the connective tissue stroma at the expense of the

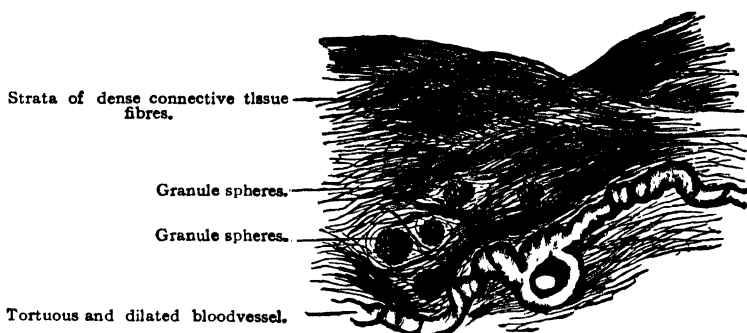


FIG. 85.—Sagittal section through the ovary of a woman aged 72 years.

cellular layer, accompanied by retrogressive metamorphosis of the graafian follicles.

The connective tissue ground substance of the ovary increases from the periphery towards the centre, and progressively compresses the epithelial structures of the organ. In the outermost layer of the ovarian stroma, the so-called tunica albuginea, the strata of short, dense connective tissue fibres increase notably in number, so that whereas at first three layers at most could be distinguished, the tunic ultimately comes to consist of from six to eight layers; at the same time also the interior ovarian stroma becomes exceedingly dense, so that numerous well-defined interlacing bundles of fibres can be made out in its substance.

The first retrogressive metamorphosis which can be observed in the graafian follicles is fatty degeneration, the formation of granule spheres. Whilst the membrana propria (the theca folliculi) of the follicle remains quite unaltered, we observe in the membrana granulosa, in addition to the ovum, and the ordinary cells of this layer, spherical aggregates of fat droplets, the granule spheres, which continually increase in size, until ultimately of the cellular contents of the follicle nothing whatever remains, and it now appears full of granule spheres and fluid. The theca folliculi has now lost its spherical shape, and assumes an ovid form (Fig. 89).

In a later stage of the degeneration of the graafian follicle, it appears as a vesicular body with a relaxed wall, thrown into numerous folds, this folded wall being formed by the theca folliculi.

The cavity of the follicle is reduced to a mere cleft, filled with a transparent substance, and the space between this cleft and the inner surface of the theca folliculi is occupied by round cells and a

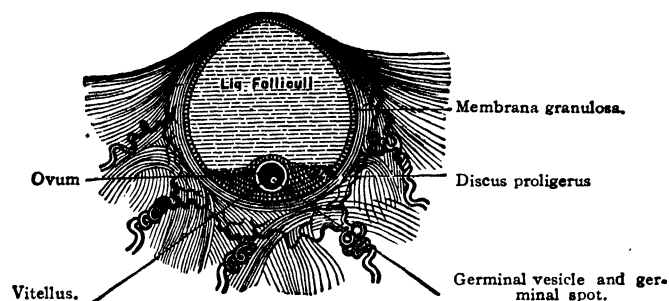


FIG. 86.—Diagrammatic representation of the Graafian Follicle.

fibrous intercellular substance, and is traversed by a vascular network. This second stage of the retrogression of the follicle may



FIG. 87.—Ovary of a girl aged 19 years. (Normal size.)



FIG. 88.—Ovary of a woman 72 years of age. (Normal size.)

therefore be designated the stage of vesicular degeneration (Fig. 90).

In the last stage of this retrogressive metamorphosis, we find the follicle completely transformed to a fibrous mass. It appears as an elongated oval body, much lobulated, connected with the surrounding stroma by thick strands of fibres; a trace of the original cavity can still be distinguished in the form of a narrow cleft, without distinguishable contents. The tissue of this body consists of connective tissue fibres, with interspersed nuclei and nuclear fibres (Fig. 91).

The three stages I have observed in the retrogression of the follicle, of which I have given a summary account above, may, I think, be explained in the following manner: When the woman's reproductive activity ceases, the graafian follicles become subject to a retrogressive metamorphosis, a fatty degeneration setting in in the cells of the membrana granulosa and in the ovum, until ultimately

the whole of the granular epithelium has undergone atrophy. The follicle now undergoes a vesicular transformation with shrinkage of its cavity, and with the formation of a new tissue which appears to be young connective tissue. As time goes on, this new connective tissue is formed in increasing quantities, until finally the entire follicle is transformed into a firm fibrous mass.

Thus we are led to infer that the gradual but extensive thickening of the tunica albuginea (i. e., the outer, condensed layer of the ovarian stroma), which, as we have seen, always occurs at the climacteric period, offers a hindrance to the bursting of the follicles



FIG. 89.

as they mature, and in this we find the explanation of the irregularity of menstruation and of the various troubles which attend the performance of that function at the time of the menopause. It is reasonable to assume that the resistance of this thickened tunica albuginea is responsible for the fact that the interval between the bursting of the successive follicles is now greater than normal, as much as six or eight weeks — this retardation of menstruation being one of the commonest ways in which the onset of the menopause is first manifested. Another phenomenon connected with the onset of the menopause also finds a plausible explanation in the anatomical grounds just mentioned. As already pointed out, in parous women the menopause sets in later than in nulliparae. At every pregnancy, the ovaries share in the more abundant nutrition of all the reproductive organs, due to the general dilatation of the intra-pelvic vessels which accompanies this process; hence the ovaries become larger, richer in lymph, and therefore softer, the cellular elements increase in size, and perhaps also in number, and it is readily con-

ceivable that in such ovaries the cellular elements are able for a longer time to resist the induration and the new formation of connective tissue which occur at the climacteric.

The numerous nervous disturbances of the climacteric epoch would appear also to depend upon the hyperplasia of the ovarian

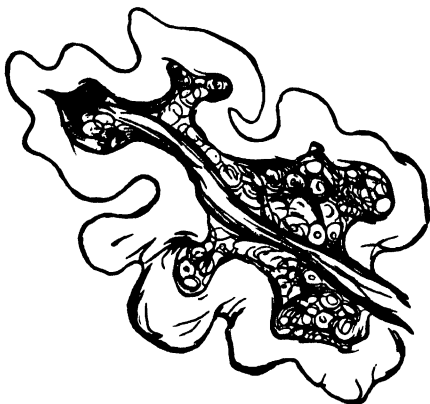


FIG. 90.

stroma which we have observed to be the characteristic anatomical change in the ovaries at this period of life.

Associated with the fibrous transformation of the graafian follicles there is, however, a failure of the so-called internal secretion of the ovaries, a matter to which much attention has recently been paid. *Brown-Séquard* has especially maintained that the ovaries secrete a substance which enters the blood, a substance which, notwithstanding the fact that its presence cannot be proved either by chemical or any other means known to us, yet is of considerable importance for the maintenance of the equilibrium of mental and physical well-being. It is supposed that the various profound disturbances of the general system occurring at the menopause¹ are dependent upon the cessation of this internal secretion of the ovary—disturbances which rise to a maximum as the atrophy of the ovary proceeds, and which only gradually pass away after a considerable lapse of time.

After the menopause is completely over, in the ovaries, as in other parts of the female reproductive organs, the signs of senile degeneration make their appearance.

¹NOTE.—In Germany, the term *Ausfallserscheinungen* is used as a general name for the various disorders of the climacteric period. The word *Ausfall* means literally *a falling out*, or *shedding*, as of the hair. No precise English equivalent of the term is known to me, nor is one really needed, the phrase *disorders of the climacteric* being sufficiently distinctive.—TRANSL.

In old women, we find the ovaries either shrunken to the form of small fibrous cords, or else degenerated to form cysts of smaller or

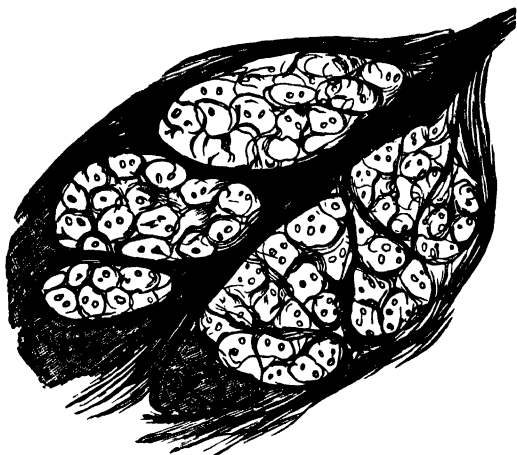


FIG. 91.

larger size, the stroma surrounding these cysts being extremely hard, dense, and tough.



FIG. 92.—Sagittal section through the Cervix of a woman 26 years of age.
Dendriform branched Glands.

Whereas at the commencement of the climacteric period, the uterus commonly exhibits a slight increase in size, owing to the condition of passive hyperaemia already described, subsequently a gradual diminution in the size of the organ may be observed. This atrophy begins with the portio vaginalis and proceeds upwards.

Whilst the body still appears undiminished in size, the vaginal portion will be found already shorter, more slender, and more flaccid. Gradually, however, the entire organ is involved in the atrophic process. The uterus is then smaller than formerly, its walls are thinner, its cavity reduced in size. Its vascularity and its sensi-



FIG. 93.—Sagittal section through the Cervix of a woman 65 years of age. Glands which have undergone Cystic Degeneration.

bility are alike diminished. The external os is smaller, and the internal os is sometimes entirely obliterated. There is a tendency at the climacteric period for the tubulo-racemose glands of the cervical mucous membrane (Fig. 92) to undergo a cystic degeneration (Fig. 93), and hence arise the cysts which are so commonly

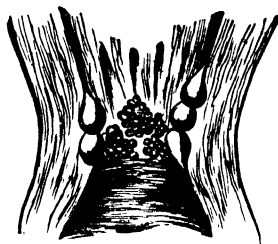


FIG. 94.—Cervix of a woman 70 years of age. The Cervical glands have undergone Cystic Degeneration.

met with on the portio vaginalis of women at this time of life, cysts varying in size from that of a millet seed to that of a pea.

In advanced life, the formation of such cysts may be regarded as normal, and sometimes in the form of grape-like clusters they almost completely occupy the lumen of the cervical canal. (Figs. 94, 95, 96, and 97).

Not infrequently, these cysts lead to the formation of polypi, by enlarging until the mucous membrane projects so far that a stalk is formed.

Examining the bodies of 47 women who died at ages varying from 42 to 80 years, I found in 28 ovula Nabothi in the cervical mucous membrane, for the most part at the os uteri externum, but in some cases also extending up to the os internum, sometimes between the plicae palmatae, sometimes isolated, sometimes grouped.

Sometimes in old women no trace of a vaginal portion remains, and the uterus is found to be transformed to a small, thin-walled, shrunken body, no more than one fourth of its original size; in such cases the saying of Graaf appears to be justified, that after the menopause the uterus returns to the size it has in the young girl. In the majority of such cases, the cavity of the uterus is also contracted (concentric atrophy). It sometimes happens, however, that



FIG. 95.—Ovula Nabothi in the Portio Vaginalis.

in old age the os externum and the os internum are the seat of atresia, whilst the intermediate portion of the cervical canal remains unaffected. In this way, especially when the cervical canal and the cavity of the body of the uterus are distended with mucus or with fungous growths, is produced what is known as the *uterus bicameratus vetularum*.

In many cases, when the cervical canal has been obliterated, we find the uterine cavity distended with mucous secretion (excentric

atrophy). The substance of the uterine wall is in old age commonly dense and tough, but occasionally, in extreme old age, less firm than formerly, withered and friable, and traversed by degenerated arteries, and in this state it is predisposed to haemorrhages (apoplexia uteri). Such intra-mural haemorrhages usually occur in the fundus; the friable uterine substance has then a blackish-red appearance, infarcted with extravasated blood; sometimes the uterine cavity is also filled with blood. In general it may be said that when the menopause is completely over, when uterine activity has entirely ceased, the uterus returns to the state in which it was before the menarche—it is physiologically dead.

The tubes become flaccid, thinner, shorter, and are at times obliterated. In the mucous membrane of the tubes in old women we no longer find any trace of the glands described by Hennig; the epithelial cells have also lost their cilia.

During the climacteric period, the vagina is usually relaxed and roomy, the mucous membrane is smooth, injected and secretes freely; subsequently, in old age, it becomes firm, tough and dry.

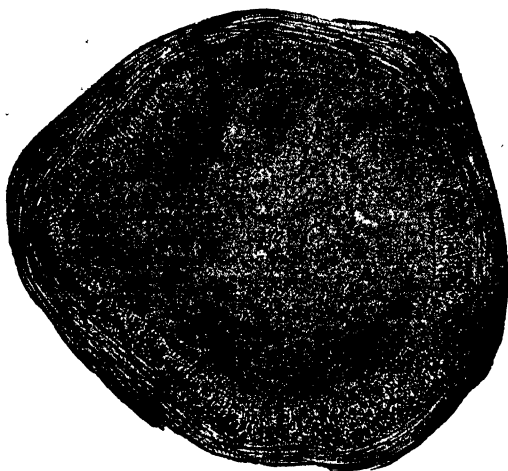


FIG. 96.—Vesicle (Ovula Nabothi) from the Uterine Mucous Membrane.

Wendeler found that the initial change of the climacteric in the ovary is a chronic and progressive endarteritis obliterans; the result of this process is, in addition to the obliteration of the follicles, a continually increasing hyaline degeneration of the smallest arteries and the arterioles, especially along the line of transition between the cortical and the medullary substance of the organ; this degeneration extends to the surrounding connective tissue, and thus leads to

the formation of peculiar, vitreous, translucent foci of sclerotic connective tissue, containing few cells or none; these are the so-called *corpora fibrosa* or *corpora albicantia*. Only subsequently to the formation of these bodies does the characteristic wrinkling of the surface of the ovary occur, with general shrinkage of the organ, these



FIG. 97.—Mucous glands undergoing Cystic Degeneration.

changes being due to the contraction that sets in in the numerous scattered foci of connective tissue, which, as already mentioned, are situated in close proximity to the cortex.

The gradual atrophy of the uterus after the extinction of its sexual activity leads to a diminution in all the diameters of the organ, so that in old women it becomes flattened as in childhood, all its curves having disappeared; the muscular substance is replaced

by connective tissue; and the portio vaginalis dwindles and even entirely disappears.

As regards the bacterial flora of the genital organs of elderly women, *Menge* and *Koenig* find that the vagina for the most part contains bacteria which do not thrive when cultivated aëroically on alkaline agar plates. In exceptional cases, however, such bacteria are found, and may even be sufficiently vigorous to produce pyogenic infection. According to *Strogamoff*, the vagina in all circumstances contains a great variety of micro-organisms — cocci, diplococci and rod-forms. Rod-forms are the prevailing types found in normal conditions in elderly women, but they are much smaller than in women who are still in the period of reproductive activity. Organisms liquefying gelatine were found in one instance only, a case of vaginal prolapse. In one half of the cases examined, there was no development of culture media inoculated from the cervix uteri, whether on agar or gelatine.

THE TIME OF THE MENOPAUSE.

The age at which the menopause begins is one which varies owing to manifold conditions, congenital and acquired, owing to the local influences which have been brought to bear on the reproductive organs during the menacme, and to the general circumstances of life during this period. In Northern Europe it commonly begins some time between the ages of 40 and 50 years. According to the most trustworthy statistical data, the commonest age for the onset of the menopause is between the ages of 45 and 50 years. Next to these in frequency we find the menopause commencing between the ages of 40 and 45 years. If, however, the menopause does not begin during the fifth decennium, it is more apt to occur during the quinquennium after 50 than during the quinquennium preceding 40 years of age; that is to say, an abnormally late menopause is more often met with than an abnormally early menopause. In a very small proportion of women does the menopause begin either after the age of 55 or before the age of 35.

THE AGE AT WHICH THE MENOPAUSE OCCURS.

My own observations show that the age at which the menopause begins is affected by the following circumstances:

1. The race (nationality) of the woman.
2. The age at which the menarche occurred.
3. The sexual activity of the woman during the period of the

menacme, the number of her pregnancies, the exercise or neglect of the function of lactation.

4. The social circumstances of the woman's life.

5. General constitutional and pathological conditions.

I. *Race.*

From the statistical data regarding the age at which the menopause occurs among the women of the various nations of Northern Europe, it appears that the latest average age for the cessation of menstruation is met with in Lapland, namely 49.4 years; next comes Norway, where the average age is 48.9; next Germany, where the average age is 47; next England, 46.1; next Russia, 44; and finally Austria, 42.2. In the four principal capital cities, the average age is: in London, 45.5; in Paris, 43.65; in Vienna, 43, and in Berlin, 47. Generally speaking, in southern countries the cessation of menstruation occurs at an earlier age than in northern countries, as the following comparison shows: northern countries: England (Tilt), 48 to 50; France (Courty), 50; North Germany (Mayer), 50; Austria (Szukits), 42; southern countries: Persia (Chardin), 27; Java, 30; various Asiatic races, 30 to 40.

In the case of 500 women of various nationalities in whom I was able to ascertain by personal observation the age at which menstruation ceased, I found that the menopause occurred:

In the quinquennium.....	35 to 40 in 48 women
In the quinquennium.....	40 to 45 in 141 women
In the quinquennium.....	45 to 50 in 177 women
In the quinquennium.....	50 to 55 in 89 women

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Thus we see that in about one tenth of my cases, menstruation ceased between the ages of 35 and 40; in more than one-fourth, between the ages of 40 and 45; in more than one-third between the ages of 45 and 50; and in about one-sixth between the ages of 50 and 55. In 267, that is, in more than one-half of the 500, menstruation ceased between the ages of 42 and 51. In 28 women, menstruation ceased before the age of 35; and in 17, after the age of 55. In a very large majority of my 500 cases the women were of German or Austro-Hungarian nationality; next, in order of frequency, came Poles, Russians, women of various southern countries, Swedish women. In women of Slavonic nationality, menstruation ceased remarkably late as compared with women of German nationality.

Brierre de Boismont, *Tilt*, *Courty*, and various other observers, have published statistical data regarding the age at which menstruation ceases in women of different nationalities. *Krieger*, compiling

from several authors, statistics relating to 2291 women (European) gives the following average results: menstruation ceased

Between the ages of 35 and 40 in.....	272 women	11.87 per cent.
Between the ages of 40 and 45 in.....	595 women	25.97 per cent.
Between the ages of 45 and 50 in.....	940 women	41.03 per cent.
Between the ages of 50 and 55 in.....	334 women	14.58 per cent.
Before 35 and after 55 in.....	150 women	6.54 per cent.
	2291	99.99

We append a statistical table showing the average age at which menstruation ceases in women of different European nationalities:

	Ger- many.	Austria- Hun- gary.	France (Paris).	England (Lon- don).	Russia.	Den- mark.	Nor- way.	Lap- land.
Number of cases.....	824	256	178	500	100	312	391	34
Average age at the ces- sation of menstrua- tion.....	47.0	42.2	44.0	46.1	45.9	44.8	48.9	49.4
Observer....	Magar	Szukits	Brierre de Bois- mont	Tilt	Lieven	Hanno- ver	Faye and Vogt	Vogt

2. *The Age at Which the Menarche Occurred.*

Until recently, it was generally believed that the earlier the age at which menstruation first made its appearance, the earlier also would the menopause occur; and that, on the other hand, the later the age at which the flow began, the later also would it cease. *Virey* summarized this opinion in the saying: *prius pubescentes prius senescunt*. This view of the matter is, however, true only in respect of the influence of climate upon sexual development. In a cold climate, a woman begins to menstruate late and ceases to menstruate late; in a hot climate the opposite conditions prevail. But if we make our comparison between women living in similar conditions as regards latitude and climate, we find that *Virey's* saying is far from accurately describing the facts.

In general, and climatic influences apart, it may be said that the earlier in any woman the age at which menstruation first occurs, the later will be the age at which menstruation ceases.

In order to ascertain the influence of the age at the menarche upon the disappearance of menstrual activity, I placed in comparison first the cases of 50 women in whom menstruation had first appeared between the ages of 12 and 16—i. e., cases of early menarche; and secondly the cases of 50 women in whom menstrea-

tion had begun between the ages of 16 and 20—i. e., cases of late menarche. The result was the following:

In the 50 women in whom the menarche had been early, the menopause occurred

At ages 35 to 40 in	5 instances
At ages 40 to 45 in	12 instances
At ages 45 to 50 in	25 instances
At ages 50 to 55 in	8 instances

On the other hand, in the 50 women in whom the menarche had been late, the menopause occurred

At ages 35 to 40 in	9 instances
At ages 40 to 45 in	28 instances
At ages 45 to 50 in	10 instances
At ages 50 to 55 in	3 instances.

Thus whilst among the women in whom the menarche had been late, there were thirteen only who continued to menstruate until they were at least 45 years of age; among those in whom the menarche had been early, the number in whom menstruation thus continued up to the age of 45 or beyond was 33, nearly three times as great.

On the other hand, in those cases in which the menarche occurred at an *abnormally* early age, i. e., before the age of 12 years, the menopause was also a remarkably early one. The menopause also came on very early in women in whom the menarche had been extremely retarded, until the age of 20 and upwards. An extremely early and an extremely late menarche alike tend to be followed by a premature menopause.

To this rule there are, however, exceptions, and we occasionally meet with women whose reproductive energies are so powerful, that the menarche occurs at an unusually early age, and the menopause is postponed to an age considerably beyond the average. Thus, among 100 women in the *Salpetrière*, *Raciborski* observed 29 in whom menstruation had begun at the exceptionally early age of 12 years, and who, notwithstanding this, all experienced a very late menopause. Three of them were still menstruating at the age of 57, 1 at 56, 2 at 52, 2 at 50, 3 at 48, 3 at 45, and 13 at an age less than 45.

Brierre de Boismont reports the case of a woman who began to menstruate in her 12th year; she married, had several children, and continued to menstruate regularly until she was 60 years of age.

The results obtained by *W. Guy*, who examined a series of 250 cases, confirm the proposition stated above, that the earlier menstruation begins (the extremely early cases being excluded), the later it ceases.

According to *Cohnstein*, who bases his conclusions upon the ob-

servation of 400 cases, in women who begin to menstruate early, the menopause occurs on an average three years later, than in women who begin to menstruate late. *Puech* also states that menstruation lasts longer in women who begin to menstruate early, than in those who begin to menstruate late. According to *Scanzoni*, in women who begin to menstruate in *very* early youth, the climacteric age is commonly reached earlier, than in those in whom puberty occurs at the normal age — commonly between the ages of 40 and 42 years.

The homology between the pathological states which, in any particular individual, occur at the respective periods of the menarche and the menopause, is sometimes extremely remarkable; the very same symptoms by which the first appearance of menstruation was preceded, recur as antecedents of the menopause. This is seen in the case of certain eczematous conditions of the skin, of dyspeptic manifestations, epistaxis, nervous disturbances, hysterical and epileptic seizures, vasomotor symptoms, congestions, cardiac troubles, albuminuria, etc. *Alibert* pointed out that certain skin diseases may appear twice only during life, once shortly before the commencement of menstruation, and the second time shortly before the cessation of menstrual activity. *Brierre de Boismont* alludes to the occurrence of hysteria and epilepsy before both these important epochs in a woman's life, whilst in the intervening period the patient had remained entirely free from such troubles. *H. Marsh* records the observation that women who just before puberty have suffered from repeated attacks of epistaxis, have suffered from the same trouble as a predominant symptom of the climacteric period. *Tilt* has been in several cases the outbreak of numerous furuncles with subsequent diarrhoea, and still more frequently peculiar attacks of severe vertigo, occurring in women just before the two critical epochs in her life, whilst in the intervening period there has been no trace of such troubles, either in connexion with menstruation, with the puerperium, or with lactation.

3. *The Woman's Sexual Activity.*

An important influence upon the early or late onset of the menopause is exerted by the degree to which a woman's reproductive functions have been exercised during the menarche. My personal observations have shown me that in women who are in good health and of a powerful build, whose menstrual flow has always been regular and sufficient in quantity, whose reproductive organs have been adequately and properly exercised, who have had a physiological amount of sexual intercourse, have given birth to several children, and have suckled these children, the cessation of the menstrual flow generally occurs much later than in women in whom the conditions of the sexual life have been the opposite of those

just mentioned. The more regular menstruation has been, and the more normal the deliveries, the later does the menopause ensue.

Especially striking is the influence of the number of deliveries upon the time of occurrence of the menopause. In women who have given birth to a number of children, menstruation as a rule continues for several years later than in sterile women, or in those who have had one or two children only. If a woman suckles her children, the date of the menopause appears also to be postponed. Deliveries late in life seem likewise to delay the onset of the menopause, whereas abortions accelerate its occurrence. If, however, pregnancy succeeds pregnancy at extremely short intervals, the menopause is likely to occur early; the same result is brought about by sexual intercourse at too early an age. The menopause occurs latest in women who have begun to menstruate early, who have married, have given birth to more than three children, and have been delivered of their last child at full term when 38 to 42 years of age.

As regards the 500 women previously mentioned, in whom I made personal observation as to the age at which the menopause occurred and the circumstances by which its onset was influenced, the effect of marriage and the number of children born is shown by the following details:

Of the 48 women in whom the menopause occurred between the ages of 35 and 40, 16 were unmarried, 6 married and childless, 18 married with one or two children, 8 married with more than two children.

Of the 141 women in whom the menopause occurred between the ages of 40 and 45, 3 were unmarried, 4 married and childless, 46 married with one or two children, 88 married with more than two children.

Of the 177 women in whom the menopause occurred between the ages of 45 and 50, 1 was unmarried, 2 were married and childless, 32 married with one or two children, 142 married with more than two children.

Of the 89 in whom the menopause occurred between the ages of 50 and 55, none were unmarried, none were childless, 19 were married with one or two children, 70 were married with more than two children.

Of the 17 women in whom the menopause occurred at an age above 55 years, there were two only who had not had more than two children, whilst there were 10 who had had six to eight children.

The influence of lactation is shown by the fact that in the case of 40 women who had not suckled their children, the mean duration

of menstrual activity was four years less than the established mean duration of 27 years.

4. *The Social Circumstances of the Woman's Life.*

The conditions in which a woman passes her life are not without influence upon the time of onset of the menopause. In general it may be said that among the women of the labouring classes, whose livelihood is so often precarious, and who are apt to suffer from habitual physical overwork, menstruation ceases at an earlier age than among the women of the well-to-do classes and those who lead an easier life. But though the climacteric thus occurs earlier among the lower than among the upper classes, the difference is not a considerable one.

According to *Mayer's* calculation, the mean age at which menstruation ceases is, in upper class women, 47.13 years, in lower class women, 46.97 years. Small as this difference appears, amounting on the average to no more than two months, it must not be forgotten that among the upper classes, menstruation begins earlier than among the lower classes, by an amount which averages 1.31 years. Thus the total duration of sexual activity is almost one and a half years longer in the upper than in the lower classes.

5. *General Constitutional and Pathological Conditions.*

An important influence upon the time of occurrence of the menopause is exerted by the individual and hereditary predisposition of the woman, by her constitutional state, and by certain illnesses from which she has suffered. Women who by inheritance are constitutionally weakly and delicate, in whom the menstrual flow has always been pale and scanty, in whom the intermenstrual intervals have been excessive, and who have a slender habit of body, attain the climacteric age earlier than women with vigorous bodily development and powerful muscles, with large breasts, and in whom menstruation has always been regular and abundant. Women with a great tendency to obesity cease to menstruate earlier than women of more normal proportions; blondes earlier than brunettes; women of phlegmatic temperament earlier than women of a sanguine and ardent temperament.

In general it may be said, that all influences which have a weakening effect upon the feminine organism, tend also to accelerate the onset of the menopause: such are, severe labour, great sorrow, wearisome occupations, severe menstrual losses, rapidly succeeding pregnancies, and abortions; also a number of pathological general states shortly to be discussed, as well as local diseases of the reproductive organs.

Fritsch points out that menstruation continues to a later age in proportion as the woman's state of general nutrition is a good one. He also asserts that women with a very large uterus, who have always had an abundant menstrual flow, those with retroflexion, with hypertrophy of the portio vaginalis, or chronic endocervicitis and endometritis, and those with small myomata which have given rise to no marked symptoms, often continue to menstruate far beyond the usual age.

The mean duration of the climacteric phenomena, from the commencement of these until the final cessation of menstruation, is about two years. This mean is made up of extremely wide individual variations; in a small proportion of the cases the climacteric manifestations may last no more than a month or two, whilst at the other end of the scale we meet with cases in which the duration extends to 4, 6, 8, and even 18 years.

In considerably more than half of all the cases, however, the duration of the climacteric manifestations varies between six months and three years. Thus, in *Tilt's* series of cases, the duration of the "change of life" was

6 months in	12.07 of all cases
1 year in	22.64 of all cases
2 years in	18.62 of all cases
3 years in	9.43 of all cases

6. *Premature, Delayed and Sudden Onset of the Menopause.*

In exceptional cases, the menopause, instead of taking place between the fortieth and the fiftieth year of life, occurs at an abnormally early or an abnormally late age.

Premature cessation of menstrual activity, in the third or the fourth decennium of life—very rarely indeed before the third decade—depends in part upon disturbances of metabolism and of haematopoiesis, and in part upon diseases of the female reproductive organs; in some cases, however, it may be due to some hereditary constitutional peculiarity; or it may occur suddenly, in consequence of some violent shock to the nervous system.

Among the disorders of metabolism which may lead to a premature menopause, excessive adiposity, lipomatosis universalis, occupies the first place. Next in order of importance come a chloroanaemic condition of the blood, pernicious anaemia, splenic leukaemia, certain of the acute infectious disorders—typhoid, cholera, scarlatina, acute articular rheumatism,—further pulmonary tuberculosis, diabetes mellitus, Graves' disease, Addison's disease, and myxoedema. These various conditions may give rise, in part by infective processes, and in part in consequence of the general cachectic condition, to atrophy of the ovaries with destruction of the

graafian follicles, and to atrophic processes in the uterus, and these changes lead to the premature cessation of menstrual activity.

Excessive obesity has a restrictive influence upon ovarian activity, manifested in part, as already mentioned, by the occurrence of sterility, but in part also, in very obese women, by the onset of a premature menopause. Among 215 cases of extreme obesity in women, I found 49 in which the menopause occurred at a remarkably early age. In these cases the menopause occurred at the following age:

In 1 woman at the age of.....	17 years
In 14 women at the age of.....	20 to 25 years
In 11 women at the age of.....	25 to 30 years
In 9 women at the age of.....	30 to 35 years
In 14 women at the age of.....	35 to 40 years

In none of these cases did the local examination of the reproductive organs disclose the existence of any noteworthy disease.

Of the diseases of the genital organs which are competent to give rise to a premature cessation of menstrual activity, the most important are the puerperal infective processes and other inflammatory states of the reproductive organs, with their results—chronic metritis, perimetritic and parametritic exudations, chronic oophoritis, atrophy of the uterus and the ovaries.

After infective puerperal processes, it sometimes happens that there is far-reaching destruction of the uterine musculature, degeneration of the uterine mucosa, permanent and irreparable atrophy of the uterus, and suppuration and atrophy of the ovaries—conditions which result in an extinction of menstrual activity. A similar result may ensue upon the persistent and long-continued pressure upon the uterus and the ovaries of a large intra-pelvic exudation; such exudation being commonly post-puerperal, but occasionally arising in the absence of pregnancy. Further, according to *Freund*, chronic atrophic parametritis may give rise to an incurable atrophy of the uterus, by interference with the circulation of the blood through the broad ligaments, and consequent impairment of the nutrition of the uterus. Gonorrhoeal inflammation may also lead to the termination of menstrual activity, when it gives rise to intramural inflammatory deposits in the uterus, and to chronic inflammatory processes in the ovaries. Tumours of the uterus and the uterine annexa may likewise induce a premature menopause.

We also meet with cases in which after a pregnancy, to all appearance normal in its course and termination, a premature menopause results. To this category belong the cases, according to *Kleinwächter* of no extreme rarity, in which perfectly healthy women are attacked by profuse uterine haemorrhage during the

course of a normal, full-term labour, or during miscarriage; subsequently, though the lying-in period is passed without further misadventure or abnormality, and in the absence of lactation, the patient becomes permanently amenorrhoeic. The normal involution of the uterus passes on into hyperinvolution, and ultimately complete atrophy of uterus and ovaries results. In some cases, moreover, such hyperinvolution with consecutive atrophy follows normal labour or abortion without the occurrence of any excessive haemorrhage.

Much more frequently do we find that rapidly successive pregnancies, with long-continued exercise of the lacteal function, in badly nourished, anaemic women, give rise to a premature menopause, due to permanent atrophy of the uterus and ovaries, which are in such cases so poorly supplied with blood. This "lactation-atrophy" is described by *Frommel* and *Thorn* as a concentric atrophy first of all affecting the corpus uteri, and to this, if the disease advances, there succeeds a general atrophy of the muscular, connective, and fatty tissues of the parametrium, the vagina, the pelvic floor, and ultimately of the ovaries, leading, when permanent, to a premature menopause.

Trauma of the genital organs may also lead to uterine atrophy and to premature menopause.

By many authors it is believed that too-early marriage, sexual excesses, and prostitution, may be the cause of *cessatio praecox*. In some cases, there is unquestionably a hereditary predisposition to a premature climacteric, since the mothers of the women in whom it occurs have themselves been similarly affected. In the remarkable case which came under my own observation, of a woman from Smyrna, there was hereditary predisposition. This woman began to menstruate when 12 years of age; menstruation was always scanty; she married when 15 years of age; and she ceased to menstruate for ever at the age of 19. In other cases we find there is a family tendency for menstruation to be delayed in its first appearance to a comparatively advanced age, and to cease at the usual time.

In cases of *cessatio mensium praecox* (unless the failure of menstruation has been quite a sudden one), and after the premature menopause is fully established, we find in the uterus and the ovaries anatomical changes similar to those met with after the natural climacteric — diminution in the size of the uterus with thinning of its walls, density and firmness of the tissues of the organ, smallness and a soft consistency of the ovaries; sometimes, also, the mammae are atrophic.

In cases of premature menopause, the troubles attending the change are commonly more severe and more enduring than those that occur at the natural menopause. Especially is this the case when the premature menopause is quite a sudden occurrence, but this

phenomenon is rare. Most commonly the premature menopause is gradual in onset; the flow becomes more scanty month by month, until at last it fails altogether to appear. Irregularity in the menstrual rhythm is not often seen in such cases. Early senescence is exceptional in these women in whom a premature menopause occurs. Emaciation, greyness of the hair, wrinkling of the skin, the growth of hairs on the face, etc., are not usually associated with the atrophy of the reproductive organs; the physiognomy and figure of women with *cessatio praecox* being usually similar to those seen in women of corresponding age in whom menstruation still continues.

Tilt enquired regarding the cause of *cessatio praecox* in 27 instances, with the following results:

In 3 instances, parturition and lactation.

In 1 instance, abortion.

In 2 instances, a fall on the sacrum during menstruation.

In 2 instances, suppression of menstruation from chill.

In 1 instance, haemorrhage from the arm during menstruation.

In 1 instance, celebration of nuptials during menstruation.

In 2 instances, severe medicinal purgation.

In 2 instances, cholera.

In 2 instances, rheumatic fever.

In 2 instances, febrile bronchitis.

In 9 instances, intermittent fever.

In 1 case *Tilt* saw cessation of menstruation occur at the age of 29, in consequence of metritis. *Atlee*, in 15 cases of ovarian tumour, saw the menopause occur at ages of 30, 39, 40 and 42. *Puech* saw a premature menopause at the age of 30 in 3 cases, in each a sequel of cholera. *Blondel* reports a case of *cessatio praecox* after prolonged galactorrhoea, although the woman had not suckled her infant; *Gottschalk* and *Rokitansky*, cases following injury to the cervix uteri; *Kivisch*, *Simpson*, and *Kleinwächter*, cases following full-time, normal deliveries, in which, however, severe losses of blood had taken place.

Courty and *Brierre de Boismont* report cases in which the menopause occurred as early as the age of 21; *Mayer*, 2 cases at the age of 22; *Krieger*, 1 case at 23; *Brierre de Boismont*, 1 case at 24; *Mayer*, 2 cases at 25; *Brierre de Boismont*, 1 case at 26, and 1 case at 27; *Guy* and *Tilt*, each 1 case at the age of 27; *Brierre de Boismont*, *Courty*, and *Guy*, each 1 case at the age of 28; *Brierre de Boismont*, *Courty*, and *Mayer*, each 1 case at the age of 29; *Guy* and *Tilt*, each 1 case at the age of 30; and *Mayer*, 5 cases at the age of 30.

An unusually late climacteric, the continuance of menstruation beyond the age of 50 years, is not an extremely rare occurrence, but

is less often seen than *cessatio praecox*. There is, however, in these cases a difficulty which must not be underestimated, namely, to distinguish between a genuine menstrual bleeding and the other uterine haemorrhages which are common precisely at this age of life, due either to textural changes in the uterus, or to neoplasmata—more especially because in these non-menstrual haemorrhages also a certain periodicity may often be detected. When on careful examination no abnormality can be discovered in the reproductive organs, when the bleeding in question recurs at the intervals and in association with the general symptoms to which the woman thus affected has been accustomed during her previous menstruations, and when the amount of blood discharged is not abnormal, it is permissible to conclude that we have to do with a persistence of true menstruation, even though the woman has some time since completed the fifth decennium of her life. In some women, in fact, the reproductive system is so energetic, that ovulation continues to an age far beyond the average, and such women are to be regarded as sexually long-lived.

Although the instances of protracted menstruation contained in the older literature of the subject are open to suspicion, owing to the fact that at that time it was not possible to distinguish with certainty between menstrual and pathological uterine haemorrhage, quite recently numerous incontestible cases of enduring sexual vitality have been put on record.

I have myself seen no less than 106 cases in which the menopause did not occur until after the age of 50 years; among these there were 4 in which the age at the menopause was 56; 5 in which it was 57; 2 in which it was 58; 1 in which it was 59; and 1 in which it was 60. *Tilt* records 128 cases of menopause occurring after 50; among these there were 4 in which the woman was 56 when menstruation ceased; 2 who were 57; 4 who were 58; 1 who was 59; 1 who was 60; and 2 who were 61. *Courty* reports a case in which menstruation persisted after the age of 65; *Mayer*, 3 cases of menopause at 64; *Beigel*, 2 cases, 1 in which menstruation continued to the age of 65, the other, to the age of 72. *Kleinwächter* observed 33 cases in which menstruation continued to an age varying from 50 to 57 years. *Emmet*, in the year 1886, published the case of a woman who was then 70 years old, and who at this advanced age continued to menstruate regularly.

That not every case in which after the age of 50 years there is recurrent, more or less periodic, haemorrhage from the genital organs, is to be regarded as an instance of delayed menopause, we are taught by the records of post mortem examination in several cases of the kind. *Scanzoni* reports the case of a woman who at the age of 60 was affected with a fairly regular periodic discharge

of blood from the vagina. During one of these hæmorrhages, she died of pneumonia, and the autopsy showed that the ovaries were completely atrophied and transformed into dense scar tissue, and contained no trace of corpus luteum or of fresh extravasation of blood, whilst in the upper part of the cervical canal there were two mucous polypi each of about the size of a bean. In another case, that of a woman 64 years of age, periodic losses of blood, at intervals of from three to four weeks, continued to the time of her death. This woman suffered from mitral valvular insufficiency, and it was clear that the hæmorrhages had been due to the venous engorgement consequent upon imperfect compensation. The ovaries were completely atrophied, and showed no trace of any recent maturation of ova; the uterus was enlarged, the mucous membrane hyperæmic, and the cavity contained a recent clot.

Not infrequently, the hæmorrhages attributed to the persistence of menstruation are really due to senile arterio-sclerosis—to rigidity and brittleness of the uterine arteries; in other cases they arise from varicosity of the veins of the cervical canal. A common cause of such bleedings from the genital passage in comparatively advanced life, is to be found in the growth of uterine myomata.

To myoma uteri we must attribute a part, though by no means all, of the cases in which menstruation seems to recur some years after the menopause has, to all appearance, been fully established. In most of these cases, indeed, we have to do with pathological hæmorrhages, the cause of which is, however, but too often obscure. Still, cases certainly occur in which, two or three years or even longer after the menopause, some unknown stimulus leads to the regular recurrence of menstruation. The possibility of such an occurrence is, in my opinion, fully proved by post mortem examinations of the bodies of elderly women in whom the menopause has been fully established and yet the ovaries are found to contain follicles of various degrees of ripeness, and also fresh corpora lutea—signs that ovulation may persist for a considerable time after the complete cessation of menstruation. Another proof of the last fact is the well known experience that women who have some time ago ceased to menstruate, may nevertheless become pregnant. *Waldeyer*, indeed, asserts that when four years have elapsed since the menopause, follicles are never to be found in the ovaries, but this negative experience is not decisive, especially as regards the cases in which regular menstruation is resumed some time after the occurrence of a premature menopause.

I have myself seen several cases in which the menopause occurred at 35, 38, 39, and 42 years, respectively; 3, 4, or 5 years later, as a result of hydropathic treatment, regular menstruation recurred. In

one case, a woman who had ceased to menstruate ten years before, gave birth to a child at the age of 45.

Numerous indisputable cases of this kind are reported in the recent literature of the subject. *Krieger* had under his personal observation a woman of a robust habit of body, in whom menstruation ceased at the age of 48 years, her eighth child having been born fifteen years before. Two years later irregular menstruation recurred, and on the cessation of these hæmorrhages, it appeared that the woman was once more gravid; she was delivered at full term of a girl. *Mayer* observed the following case: A strong working-class woman 33 years of age had begun to menstruate regularly when 13 years old; between the ages of 17 and 28 she gave birth to five children, and in addition had one miscarriage when 19 years old. Widowed at the age of 29, she fell ill, and on examination the uterus was found to be small and relaxed, whilst the vaginal portion of the cervix was reduced to a mere rudiment. Since she had been 22 years of age she had had persistent leucorrhœa, but no trace of menstrual hæmorrhage; yet since that age she had had three children. *Renaudin* delivered a woman 61 years of age, who had ceased to menstruate 12 years earlier. *Meissner* reports a case in which a woman first began to menstruate at the age of 20, had her first child when 47 years old, and gave birth to the last of her eight children when 60 years of age.

The sudden and permanent cessation of menstruation, whether at the normal climacteric age, or earlier in life, is always a pathological occurrence. As compared with the normal, gradual disappearance of menstruation, associated with the usual climacteric symptoms, such a sudden extinction of menstrual activity is, moreover, quite rare. When it does occur, the cause is to be found in one of various pathological general states, such as one of the acute infectious disorders, or some other exhausting disease, or sometimes in some local disease of the reproductive organs; occasionally, however, it may occur in perfect health, in consequence of some powerful physical or mental stimulus, such as a severe blow or intense fright.

This sudden menopause has been observed after severe labour or abortion with profuse hæmorrhage, or after cholera or typhoid; we must assume that in such cases the anaemia of the genital organs has disturbed the function of ovulation; whilst in cases due to mental shock, the interference with ovulation must be through the intermediation of the nervous system. Frequently, of course, in these cases, the sudden menopause is also a premature one.

Tilt reports a case in which a sudden menopause ensued upon phlebotomy during menstruation; several cases also in which women at ages varying from 30 to 34, or 39 years, ceased to menstruate

suddenly and permanently in consequence of grief at the unexpected death of the husband; and another case of sudden menopause due to a fall down stairs. *Courty* reports three cases of sudden menopause at the age of 30, consequent upon an attack of cholera. *Dusourd* has seen three cases in which, in women aged 40 to 43 years, severe haemorrhoidal bleeding was followed by sudden and permanent cessation of menstruation. *Mayer* reports the case of a delicate middle-class woman 34 years of age, who had begun to menstruate at the age of 14, had married at the age of 20, and at the age of 21 after a normal delivery, ceased for ever to menstruate; and another case of a working-class woman 34 years of age who first menstruated at the age of 13 years, married at the age of 20, had two children in rapid succession, and finally ceased to menstruate, in consequence of a fright, at the age of 30 years. *Krieger* reports the case of a very nervous woman who first menstruated at the age of thirteen, and in whom at the age of 23 a sudden menopause ensued upon a nervous attack; in another case reported by the same observer, a sudden menopause occurred in a delicate woman 41 years of age owing to her husband's death — this woman had previously experienced six months amenorrhoea in consequence of sorrow at the death of one of her children. The following remarkable case is reported by *Brierre de Boismont*: A sempstress began to menstruate at the age of 13 years; she married very soon after this, and gave birth to four children, the last when 21 years of age. In the course of the following year there was a fire in the house, and owing to this fright a sudden menopause occurred. Similar cases have been reported quite recently by *Bossi* and *Walter*.

The harmful influence which the occurrence of a sudden menopause exercises upon the general condition of the woman who experiences it, is manifested chiefly by violent circulatory disturbances, hyperaemia and congestion of the brain, lungs, and abdominal organs, and by states of excitement and depression of the nervous system. Of the vicarious haemorrhages which are apt to ensue upon such a sudden menopause, we have already spoken.

Generally speaking, women in middle life, in whom the whole organism is accustomed to the onset and decline of the menstrual hyperaemia, endure the functional disturbances induced by a sudden and complete cessation of menstruation much more easily than women who have already entered upon the climacteric age, or have nearly attained that age. The climacteric age is one in which women are already predisposed to circulatory disturbances in the pelvic organs, and it will readily be understood that in them the sudden interruption of the menstrual haemorrhages will have more serious consequences than in women in the prime of their sexual life, and therefore endowed with a greater power of resisting disturbances of the normal functions.

PATHOLOGY OF THE MENOPAUSE.

Diseases of the Genital Organs.

Among the commonest of the symptoms of the sexual epoch of the menopause is menorrhagia. It occurs especially in plethoric women, in those who during the prime of their sexual life have been accustomed to menstruate abundantly, and in those who have given birth to many children or had many miscarriages; but it is seen also in weakly and delicate individuals, in whom the tissues of the genital organs have become extremely flaccid and loose in texture. A luxurious mode of life, more especially a free consumption of alcoholic beverages, and also frequent sexual intercourse during the climacteric period, appear to favour the occurrence of menorrhagia at this epoch.

Not infrequently, menorrhagia is the first sign of the commencement of the climacteric, menstruation having been hitherto regular, and not excessive in amount. Generally, when this climacteric menorrhagia begins, the intervals also become shorter, the menstrual period being reduced to three or even two weeks. At times, however, the more profuse menstruation recurs at longer intervals, six weeks, two months, or even longer. In any case, the occurrence at the climacteric age of a severe or atypical haemorrhage, renders it the imperative duty of the physician to undertake a local examination of the genital organs; for it is necessary to ascertain without delay whether such a haemorrhage is a true climacteric phenomenon, or whether it is due to some actual disease of the reproductive organs — a neoplasm, or the like.

If the haemorrhage is due solely to the change of life, the vaginal portion of the cervix will usually be found soft and flaccid, bleeding readily on slight injury, and sometimes eroded; there is generally associated leucorrhoea. This relaxation and loss of firmness in the uterine tissues at the time of the menopause is the cause of the predisposition to excessive haemorrhage. An additional cause exists in the circulatory disturbances in the pelvic organs. We presume that women affected with menorrhagia at this time of life suffer from some persistent disturbance in the region of the inferior vena cava, whereby the outflow of blood from the veins of the pelvis is hindered, and a chronic condition of stasis in the uterus is conditioned. Hence arises distension of the vessels of the uterine mucous membrane, and this rhexis is relieved by the excessive haemorrhages. In these considerations lies the explanation of the fact that women who have had many children or many miscarriages, are especially prone to suffer from climacteric menorrhagia; and also women who for any reason are predisposed to intra-abdominal stasis,

Another cause of climacteric menorrhagia is to be found in the frequent occurrence at this epoch of advanced arterio-sclerotic changes in the uterine blood vessels, the disease being in some cases limited to the uterine arteries, and in others part of a general arterial degeneration. The blood may be derived from ruptured sclerotic capillaries of the mucous membrane; but in other cases it exudes in consequence of passive hyperaemia, without actual rupture of the bloodvessels. To such haemorrhages from atheromatous vessels we must refer many of the attacks of uterine haemorrhage that occur in elderly women, such as were formerly, before their true nature was understood, commonly regarded as instances of a very late return of menstruation. By careful examination the exact source of the blood can often be detected in such cases.

According to *Theilhaber*, one cause of the haemorrhages occurring at the climacteric is to be found in the atrophy of the uterine muscle which takes place at this period of life. Except during pregnancy and the puerperium, the uterus is usually in a state of moderate contraction; during the height of the menstrual flux, however, the uterus is relaxed. Then, as contraction of the muscle sets in, the menstrual hyperaemia and consequent haemorrhage are gradually brought to an end. When this contraction is insufficient, the hyperaemia and swelling of the uterus are more enduring. In association with the atrophy of the uterine muscle at the climacteric, there usually occurs a notable diminution in the size of the uterine vessels, so that, notwithstanding the diminished strength of the muscular contractions, any excessive loss of blood is prevented. But if this diminution in the calibre of the vessels fails to take place, the atony of the uterine muscle leads to hyperaemia, to haemorrhage, and often, in addition, to oedema of the organ, with elongation and thickening of its walls — hyperplasia uteri preclimacterica.

Among diseases of the uterus which during the climacteric may give rise to severe haemorrhage, and may lead to the mistaken opinion that menstruation still continues, we must in the first place mention carcinomatous disease of the cervix and of the body of the uterus; next in importance come myoma and fibrous polypi; less frequent causes of such haemorrhages are fungous endometritis, erosions, mucous polypi, prolapse of the uterus, and ovarian cystoma.

The climacteric age gives rise to a predisposition, not only to bleeding, but also to other pathological changes in the reproductive organs. We can by no means endorse the opinion of *Currier* — one long ago expressed also by *Brierre de Boismont* — that women during the sexual epoch of the menopause are less disposed to diseases of all kinds, and among them to diseases of the genital organs, than younger women, for the reason that their tissues are endowed with less vitality, and are, therefore, more resistant to all the causes

of disease. On the contrary, the number of pathological disorders liable to affect the reproductive organs precisely at this period of life, is strikingly large. Among my 500 cases of women at the climacteric age, there were 440 who complained of such symptoms, the diseases from which they suffered being, in order of frequency:

Profuse hæmorrhages in.....	286 cases
Chronic metritis in.....	79 cases
Leucorrhœa in.....	327 cases
Displacements of the uterus.....	117 cases
viz., prolapsus in.....	65 cases
antelexion and retroflexion in.....	52 cases
Genital pruritus in.....	46 cases
Vaginismus in.....	12 cases
Carcinoma uteri in.....	3 cases
Myoma uteri in.....	5 cases
Tumor mammae in.....	8 cases

I need hardly point out that in many individuals more than one of these diseases were present at the same time.

The most obvious feature of these statistics is the extraordinary frequency of uterine hæmorrhage and of leucorrhœa in climacteric women. The former condition was present in more than half my cases; the latter actually in three-fourths.

The same two pathological states were also those most frequently recorded in *Tilt's* statistics. This author, in 446 women at the climacteric, found the following diseases of the reproductive apparatus:

Hæmorrhages in.....	138 cases
Leucorrhœa recurring at irregular intervals in.....	146 cases
Leucorrhœa recurring monthly in.....	12 cases
Remittent menstruation in.....	33 cases
Vaginitis in.....	4 cases
Follicular inflammation of the vulva in.....	10 cases
Inflammation of the labia in.....	4 cases
Ulceration of the cervix uteri in.....	9 cases
Prolapsus uteri in.....	5 cases
Uterine polypi in.....	4 cases
Fibrous tumours of the uterus in.....	4 cases
Cancer of the uterus in.....	4 cases
Chronic ovarian tumours in.....	3 cases
Irritation and swelling of the breasts in.....	14 cases
Lacteal or gelatinous secretion in breasts in.....	2 cases
Hard, non-malignant tumour of the breast in.....	2 cases
Chancre of the breast in.....	1 case
Frequent sedimentation in the urine in.....	49 cases
Difficult and painful micturition in.....	9 cases
Incontinence of urine in.....	4 cases
Hæmaturia in.....	1 case
Erectile tumour of the urinary meatus in.....	2 cases
Perineal abscess in.....	2 cases

Chronic metritis and endometritis come under observation with considerable frequency during the climacteric age, but as a rule

these diseases have originated during the period of sexual maturity, and in exceptional instances only does the cessation of the menses appear to be the etiological starting point of these disorders. In fact, this occurs only when the menopause is premature, or when it is quite sudden in onset, whether this be due to noxious influences or to constitutional disorder. For the menstrual process quite normally gives rise to a certain congestion of the genital organs; and should menstruation be suddenly suppressed, the blood-stasis in the uterus becomes so extreme that morbid tissue changes are very likely to ensue. And when chronic metritis has occurred before, the congestion and stasis in the uterus at the climacteric will usually suffice to light up the inflammatory process afresh. This is the explanation of the fact that symptoms of slight metritis make their appearance at the very beginning of the climax, manifested by thickening of the corpus uteri and of the portio vaginalis of the cervix, by swelling and softening of the mucous membrane, and by abundant secretion. In those who, either after full-term delivery or after abortion, have suffered formerly from chronic metritis or endometritis, but who have been quite free from any symptoms of these troubles for many years prior to the climacteric, it often happens that the change of life is ushered in by symptoms of congestion of the uterus with associated leucorrhoea. With the completion of the menopause, however, the resulting involution of the uterus exerts a favourable influence upon all such chronic inflammatory processes in the genital organs; as the atrophy progresses, the periodic attacks of congestion cease to recur. Thus it happens that women who for years have suffered from haemorrhages, from inflammatory disorders of the genital organs, and from various other troubles of a similar nature, will, once the menopause is fully over, feel quite well up to an advanced period of life—they seem as it were to begin life afresh.

According to *Bennet*, the characteristic signs of climacteric metritis are that the inflammatory symptoms are less pronounced, that the pains are less severe, that elongation of the cervix is less often seen, and that fungous changes are less marked, than is the case in the chronic metritis of younger women. On the contrary, the cervix appears smaller, often somewhat lobulated, it is harder, granulations are numerous, ulceration is rare, the enlargement of the uterine cavity is but slight. *Bennet's* views are, however, opposed by *Scanzoni*, who maintains that there is no notable difference between the chronic metritis of younger women and the disease as it occurs in women at the climacteric.

In fact, the chronic metritis and endometritis of women during the climacteric age, differs in no important respect from these diseases as they are seen in women during their sexual prime. We

merely note that the enlargement of the uterus is less marked; but the thickening and extreme hyperaemia of the mucous membrane are the same in both cases, the secretion is increased in quantity, the vaginal portion of the cervix is elongated, and usually displays erosions, excoriations, or ulcers. The subjective troubles appear less pronounced than in the case of the metritis of the menacme. The prognosis is as a rule a more favourable one than in the earlier years of sexual life, for as soon as the series of involuntary processes is completed, when the retrogressive changes in the genital organs are at an end, when senile atrophy of the uterus and the uterine annexa has set in, a cure of the troubles formerly so obstinate and so enduring speedily takes place.

Quite recently, much has been written upon the subject of a peculiar senile endometritis (*Patru, Skene, Munde, Rüder, Sheldon, Herman*, and others), and it has been described as "a peculiar form of senile, haemorrhagic, leucocytal hyperplasia of the uterine mucous membrane" (*Gottschalk*). According to *Maurange* and *Lorain* it occurs in as many as 7.2% of elderly women. It is seen especially in women who earlier in life have suffered from diseases of the genital organs, more especially those who have previously suffered from endometritis; at times a senile vulvitis or vaginitis is the cause of the disease. Displacements of the uterus with kinking of its canal, whereby retention of the secretion and its decomposition are induced, has been assigned as an additional cause of the disorder, also prolapse of the uterus, and, in isolated instances, necrotic fibromata. According to the degree to which the atrophy of the tissues has proceeded, and according as the mucous membrane is still partly retained or entirely destroyed, and according to the extent to which the uterine vessels have been affected with the sclerotic processes of old age, does the pathologico-anatomical picture of senile endometritis vary. It may affect the body only of the uterus, it may extend also to the cervix, the vagina, and even the vulva; upwards it may pass to the uterine annexa and to the peritoneum. The first and most important symptom of this senile endometritis is the outflow, usually intermittent, rarely continuous, of a sero-purulent, and sometimes sanguineous discharge, with a powerful foetid smell; there are colicky pains, which pass off when the uterus has emptied itself; often, also, there are atypical bleedings, which are not profuse. The uterus is usually found to be larger than the atrophy general at the patient's age would have led us to expect, it is often retroflexed, the cervix is thickened, the lips of the os uteri are usually everted and raw. When persistent, this senile endometritis causes profound constitutional disturbance, and is often difficult to differentiate from carcinoma of the uterus.

Under the name of senile irritation of the uterus, *Maxwell* has described a disease occurring at the climacteric, characterized by an enormously increased irritability of the uterus, with marked reflex manifestations; in these cases also we may perhaps have to do with a senile endometritis. The most pronounced symptom is a severe and constant uterine pain, to which in the course of the disease are super-added pains in the gastric and cardiac regions, the rectum, and the spinal column; these pains lasted a long time, and their severity was such that it became necessary in some cases to remove the uterus.

Hydrometra is a disease which makes its appearance principally late in the climacteric period, when menstruation has already completely ceased, and when the adhesions associated with the climacteric atrophy of the uterus have led to atresia of the cervical canal. Among 74 cases of hydrometra (from the material of the Pathologico-Anatomical Institute of Prague, in the years 1868 to 1871) not one of the women was less than 40 years of age; the age distribution of the cases was in fact the following:

Quinquennium 40 to 45.....	3 cases
Quinquennium 45 to 50.....	2 cases
Quinquennium 50 to 55.....	2 cases
Quinquennium 55 to 60.....	8 cases
Quinquennium 60 to 65.....	18 cases
Quinquennium 65 to 70.....	12 cases
Quinquennium 70 to 75.....	11 cases
Quinquennium 75 to 80.....	8 cases
Quinquennium 80 to 85.....	4 cases
Quinquennium 85 to 90.....	6 cases

In 40 of these cases, the occlusion was in the region of the os internum, in 23 it was in the region of the os externum, in 9 cases the whole length of the cervical canal was obliterated, and in 2 both the internal and the external os were occluded, the intervening portion of the cervical canal being still patent. In the two latter cases, there was hydrometra bicamerata, with retroflexion of the uterus.

Late in the climacteric period, haematometra also occurs, though less often than hydrometra. When, in cases in which the os uteri externum is occluded, in consequence of adhesion between the vaginal walls and the vaginal portion of the cervix, as a sequel of the vaginitis ulcerosa adhesiva of elderly women, there is haemorrhage from the atheromatous vessels of the uterus or the tubes, the blood necessarily distends the uterine cavity.

During the climacteric period, leucorrhoea is so extraordinarily frequent, as the figures previously given show, that the assumption is justified that with the diminution or cessation of the menstrual flow, this hypersecretion from the genital mucous membranes forms as it were a kind of vicarious flux. Sometimes, as in 12 cases recorded by *Tilt*, we actually have a periodic "menstrual leucorrhoea";

in one of these cases the discharge recurred at regular monthly intervals for 12 months, in another for 18 months, in several for 2 years, and in one for as long as 7 years. It is only by careful examination that the exact source of the discharge can be determined, for during the climacteric also, as well as earlier in life, leucorrhoea may be due either to endometritis or to colpitis. A muco-serous or sanguino-serous secretion may also be due to slight vulvitis.

A peculiar form of inflammation occurring after the completion of the menopause, and after the atrophic process in the vagina is considerably advanced, is known as colpitis senilis. In this disease, ulceration readily occurs, followed by cicatricial adhesion between the anterior and posterior walls of the vagina (*vaginitis adhaesiva vetularum*); in other cases herpetiform eruptions arise, with a tendency to pustule formation; occlusion of the vagina may lead to hydrometra and pyometra; sometimes the obliteration of the vagina is complete, so that there is neither outlet for blood from the uterus, nor inlet for the penis during coitus. This *vaginitis adhaesiva vetularum* is by no means rare in the climacteric period; as a rule it does not give rise to very serious trouble, the most prominent symptom being usually somewhat persistent haemorrhage, unaccompanied by any evil odour. On local examination, the characteristic strings of scar tissue are felt, passing from the *portio vaginalis* to the narrowed, senile vaginal fornix; from the cervical canal there exudes a usually somewhat vitreous mucus, mixed with blood. The cervix itself is thin and atrophied, the uterus also is greatly diminished in size.

The frequency at the time of the menopause of such catarrhal inflammatory processes in the vagina and vulva is said by *Duprès* to depend on the weakness or paresis of the bladder which is so common in women at this time of life. Owing to the incomplete evacuation of the urine, cystitis very readily ensues; the urine is evacuated involuntarily during sleep, and some of this fluid passes through the vaginal orifice, giving rise all the more readily to colpitis, because the secretion of the atrophic mucous membrane no longer possesses the normal acid bactericidal properties. According to *Scott*, vulvitis may also arise as a sequel of calculus-formation in the glands of Bartholin, a frequent occurrence in elderly life, followed by inflammation and abscess-formation in these glands. Among the diseases of the genital organs at the climacteric period, *Fritsch* also enumerates urethral caruncle and carcinoma of the clitoris.

Displacements of the Uterus.—Among the commonest of the displacements of the uterus occurring during and after the menopause, is prolapse of the organ. Previously existing descent of the uterus is apt to be greatly aggravated at the climacteric, a partial prolapse,

for instance, becoming complete; or prolapse of the uterus may first set in at this period of life.

There are several contributory causes of the liability to prolapse at this particular epoch, especially in women who have had a great many children, and in those with either enlargement of the uterus or with lacerated perineum; the most powerful of these causes being the weakening of the uterine supports in consequence of the general relaxation of the pelvic tissues. At the menopause, the connective tissue by means of which the uterus is attached to surrounding structures, withers; simultaneously the vagina atrophies, and this source of support is weakened; the whole pelvic floor loses its firmness and power of support. For these reasons, a uterus which has hitherto been in correct position readily becomes retroverted and to some extent prolapsed; whilst one that was already thus far displaced prior to the menopause, will now be apt to descend still further till it rests upon the perineum. With the disappearance from the vulva and the perineum of the adipose tissue on which their firmness so largely depends, complete prolapse of the uterus is now likely to ensue. Prolapse of the urethra may also result from senile involution of the pelvic contents.

Among my 500 cases of women at the climacteric, there were 65 instances of more or less severe prolapse of the uterus. The frequency of prolapse in women at the climacteric and in those at a more advanced age, is shown by the following figures, which are compiled from the post mortem statistics of the Pathologico-Anatomical Institute of Prague (years 1868 to 1871). Prolapse of the uterus was found:

In the quinquennium 30 to 35 in.....	2 women
In the quinquennium 35 to 40 in.....	2 women
In the quinquennium 40 to 45 in.....	6 women
In the quinquennium 45 to 50 in.....	3 women
In the quinquennium 50 to 55 in.....	6 women
In the quinquennium 55 to 60 in.....	8 women
In the quinquennium 60 to 65 in.....	6 women
In the quinquennium 65 to 70 in.....	4 women
In the quinquennium 70 to 75 in.....	4 women
In the quinquennium 75 to 80 in.....	4 women
In the quinquennium 80 to 85 in.....	2 women

Flexions and versions of the uterus, common as they are at the time of the menopause, have no longer the same importance that they possessed during the prime of the sexual life. For on the one part the size of the uterus is greatly diminished, in consequence of the lessened blood-supply and of senile involution of the organ; and on the other, after the cessation of menstruation, the profuse hæmorrhages and severe colicky pains which for the most part occurred during menstruation in these cases of kinking of the uterine canal, and which gave rise to such severe general disturb-

ance, now no longer occur. Herein lies the explanation of the fact, well known to all experienced practitioners, that women who have for many years suffered from retroflexion or retroversion of the uterus associated with severe and painful symptoms, cease to suffer after the menopause is established, and regain excellent health, although the local condition of the uterus remains unrelieved.

Neoplasmata of the Uterus and of the Uterine Annexa.—The most serious danger to the life of a woman during the climacteric period is to be found in the strong tendency to the occurrence of carcinomatous disease of the uterus—a predisposition so marked that not less than one-half of all illnesses affecting the reproductive organs of women at this age are cases of carcinoma of the uterus. The disease occurs especially at the beginning of the climacteric, between the ages of 45 and 50 years, most often in the form of carcinoma of the portio vaginalis, whereas after the completion of the menopause, carcinoma of the body of the uterus is the preponderant form. The true reason for the frequency of the occurrence of carcinoma at this period of life will only become clear to us when we are more fully acquainted with the nature and origin of this form of malignant disease. Meanwhile, it would seem that the predisposition to cancer during and shortly after the menopause depends upon the anatomical changes in the reproductive organs at the time of involution, which render these organs a more suitable soil for the proliferation of malignant growths; and further it is probable that the loss of the acid, bactericidal quality of the vaginal secretion, opens the door for the entrance of pathogenic micro-organisms. Noteworthy is the observation of *Baer* and *Leopold*, that very frequently a preclimacteric or climacteric fungous endometritis forms the stage of transition to the development of carcinoma of the body of the uterus. At the time of the menopause there is also an increased liability to the occurrence of cancer of the ovaries. Numerous statistical data have been published regarding the frequency with which carcinoma of the uterus occurs at various periods in women's lives, and, notwithstanding all variations, one fact stands out clearly, namely, that this disease occurs most frequently in the fourth and fifth decennia, and above all during the climacteric period.

From *Gusserow's* collection of 526 cases, observed by *Lebert*, *Kiwisch*, *Chiari*, *Scanzoni*, and *Saexinger*, the following table has been drawn up, and it shows very clearly the great preponderance of the disease in the fifth decennium of a woman's life:

At ages of from 20 to 30 there were.....	12 cases
At ages of from 30 to 40 there were.....	161 cases
At ages of from 40 to 50 there were.....	217 cases
At ages of from 50 to 60 there were.....	102 cases
At ages of from 60 to 70 there were.....	38 cases
At ages of from 70 and upwards there were.....	5 cases

From the mortality statistics we obtain a similar result as regards the age incidence of carcinoma of the uterus. Thus, in England there died of this disease in one year:

Women at ages of from 15 to 25.....	44
Women at ages of from 25 to 35.....	184
Women at ages of from 35 to 45.....	717
Women at ages of from 45 to 55.....	1110
Women at ages of from 55 to 65.....	1116
Women at ages of from 65 to 75.....	876

Coming now to the consideration of fibromyomata of the uterus, we cannot share the opinion that at the climacteric age there is a special predisposition to the origination of such tumours, or that the climax favours the growth of already existing fibromyomata. It appears to us that in the preclimacteric epoch and the commencement of the climacteric, the symptoms of existing fibromyomata become more troublesome, the hæmorrhages are more severe, the pains more violent; but that as the menopause is established, these troublesome symptoms decline progressively in intensity, and not only is there an arrest in the growth of the tumours, but often an actual diminution in their size.

I have myself repeatedly observed such cases, in which I had the opportunity of watching the growth of the myomata during a period of ten years or more. Other cases, indeed, show that myomata may increase in size after the menopause, at times with remarkable rapidity, and further that at this period of life a malignant degeneration may occur in such tumours. Carcinomatous, sarcomatous, and myxomatous degeneration have been observed, and also the transformation of a myoma into a soft fibrocystic tumour.

Atrophy of fibromyomatous tumours at the menopause, associated with the atrophy of the uterus that then occurs, has been observed by *Playfair* and by *Doran*. The tumour shrinks, its muscle-cells become smaller, and undergo fatty degeneration, there is an increase in the interstitial connective tissue, so that ultimately the fibromyoma is transformed into a firm and dense fibroid swelling. Cases in the older literature and also a recent observation of *Yamagiron* have shown that calcification of uterine fibromyomata sometimes occurs, leading to the formation of the so-called "uterine calculi." In the case of pure myomata, the diminution in size occurring at the climacteric is generally due to resorption and fatty degeneration, whereas in the case of fibromyoma it depends on induration and atrophy. It remains uncertain whether the growth of purely fibrous tumours is also affected by the climacteric.

Whilst the influence of the climacteric on the growth of fibromyomata is thus usually advantageous to the patient, exceptions occur,

as is shown by cases recorded by *Lawson Tait*, *Schorler*, and *Boerner*; the last-named author points out that at the climacteric there is a tendency for the transformation of fibromyomata into sarcomata.

Kleinwächter had under observation 78 cases of fibromyomata of the uterus in women who were older than 45 years; in only 8 of these was a diminution in the size of the tumour observed at the menopause; in 11 cases at this time, the tumour increased in size more or less rapidly; in 3 cases, a carcinomatous change occurred in the tumour; in 3 cases, the tumour was first observed at the time of the menopause; in 13 cases, the haemorrhages appeared to undergo a complete arrest at the menopause, but the size of the tumour was not affected; in the remaining 48 cases, no influence, either favourable or unfavourable, appeared to be exercised by the menopause on the fibromyoma of the uterus.

Cases reported by *Rogival*, *Simpson*, and *Gusserow* indicate the existence of a certain predisposition to the growth of sarcomata of the uterus at the climacteric period. *Gusserow* more particularly insists on the fact that we must bear in mind the likelihood of the origination of a fibrosarcoma or of the sarcomatous transformation of a fibromyoma, in all cases in which a fibrous tumour of the uterus first attracts attention at the climacteric period; or in which a tumour hitherto small and inconspicuous and giving little or no trouble, begins at this time to increase in size or to give rise to troublesome symptoms.

Neuroses of the Reproductive Organs.—One of the commonest neuroses of the reproductive organs at the climacteric period is pruritus vaginae et vulvae, and it is one of the most distressing symptoms of which women of this age complain. The disorder depends upon a hyperaesthesia of the sensory nerves of the vagina and the external organs of generation. It is characterized by enduring sensations of itching and burning, which may be either periodic (and then usually nocturnal) or continuous; at times it becomes so severe that the women thus affected have an unceasing desire to scratch, avoid all society, and ultimately find life quite unbearable. In the slighter degrees of pruritus, no objective changes are to be observed in the genital organs, or at most some slight hyperaemia of the vaginal orifice. In the more severe forms, however, there are local nutritive changes: the labia are swollen, their surface has an erythematous blush, a number of the hair-follicles are enlarged and prominent; the vaginal orifice is abnormally sensitive, it is scarlet or livid-red in colour and here and there denuded of epithelium, and there are scattered mucous follicles distended with a serous or purulent fluid; these small vessels are to be seen chiefly on the inner surfaces of the labia minora and around the clitoris. At the same time, the vulva secretes an acid, burning

fluid, which greatly increases the patient's sufferings, and at times impels her irresistibly to the practice of masturbation. In cases of long standing, we find hypertrophy, elongation, and deformity of the nymphæ, and pigmentation of these organs, with the formation of varices.

According to *Fritsch*, in exceptional cases pollutions are the originating cause of the pruritus, and this may be the case in women who are not sexually passionate. It occurs, indeed, especially in matrons who have not had sexual intercourse for years, and who have quite ceased to think about sexual matters; during the night, such a woman will begin to have voluptuous dreams, associated with a degree of sexual stimulation which is described as being actually painful. The woman often suffers greatly from these lascivious sensations. She complains that she cannot understand how it is that she has become affected with such utterly undesired feelings. She becomes profoundly depressed. Coitus often gives no relief whatever; but many women thus affected declare, as *Fritsch* points out, that by powerful, almost involuntary scratching, the stimulus is speedily subdued, and that for this reason they are absolutely compelled to scratch. It will readily be understood, that in this way persistent pruritus will arise, with local effects of scratching, and vulval eczema. According to the same author, in some instances pruritus is due to great insufficiency of secretion, such as occurs in the endometritis atrophicans which he was the first to describe. This scanty secretion, as it passes over the external genital organs, gives rise to irritation and itching. Haemorrhoids also play a part in the etiology of pruritus.

Diseases of the Mammæ.—The sympathy which in the earlier phases of the sexual life—during the menarche, during pregnancy, and during the puerperium—so obviously exists between the breasts and the uterus, is seen also during the climacteric period. It now finds expression chiefly in the marked tendency to new growths in the mammae, a matter to which attention was already drawn by *Galén*. The commonest of these neoplasmata is carcinoma mammae, a disease which occurs chiefly during the climacteric epoch. In the great majority of cases, cancer of the breast is a primary disorder; in exceptional cases, however, the carcinoma of the breast arises by metastasis from a cancer of the uterus or the ovary. Sometimes the breast tumour is preceded by *Paget's* disease of the nipple. For several years the patient suffers from what appears to be a chronic dermatitis of the nipple, the areola mammae, and the surrounding skin; but ultimately, and hardly ever before the commencement of the menopause, carcinoma of the breast ensues.

The older statistical enquiries of *Birkett*, *Lebert*, *Scanzoni*, and *Velpeau*, showed that carcinoma mammae most commonly occurred

between the ages of 40 and 50 years, and next to that in frequency between the ages of 50 and 60 years.

A general hypertrophy of the mammary gland, affecting not only the enveloping and intra-lobular adipose and connective tissue, but also the proper glandular substance, is very rarely observed during the climacteric period; but in the preclimacteric epoch and in the early part of the climacteric, we not uncommonly see a hyperplasia of the adipose tissue of the breast, either as a local manifestation of a developing general obesity, lipomatosis universalis, or as a purely local excessive deposit of fat. In such circumstances, the *mammæ* may at times be transformed into monstrous tumours.

Diseases of the Organs of Circulation.

Among the cardiac disorders of the menopause, the earliest and the commonest is, in my own experience, the following. At the time of the menopause, exceptionally not till after the complete cessation of menstruation, but usually at the commencement of this period of life, some time, that is to say, between the age of 40 and 50, either when menstruation has become irregular, the intermenstrual interval having become longer or shorter than has hitherto been the case, or when the discharge has become abnormal in character, a woman who has not before suffered from any kind of cardiac disorder, will begin to complain of paroxysms of palpitation.

In some cases the attacks of palpitation occur in the absence of any discoverable exciting cause; in others, some trifling stimulus gives rise to them. They may arise when the patient is in any position, walking, standing, sitting, or recumbent; sometimes even during sleep. The subjective sensation aroused by the increased force and frequency of the cardiac action is described as extremely distressing; it is associated with a feeling of anxiety (*Angst*), with a sense of pressure in the chest, with forcible pulsation of the carotids and of the abdominal aorta; frequently also with a feeling of a rush of blood to the head, with fugitive heats, and severe headache; sometimes towards the end of the attack there is a sense of flickering before the eyes (as of *muscae volitantes*), *tinnitus aurium*, dizziness, and in rare cases actual syncope.

Objectively, during the paroxysm, a notable increase in the frequency of the heart's action can be detected, the pulse-rate rising to 120 or even 150 per minute. In most of my cases, the pulse throughout the attack remained strong, well-filled, and regular. Sphygmographic tracings taken during the seizures showed a remarkably high pulse-wave, the ascending limb of the curve rose rapidly and suddenly, the descending limb fell with corresponding steepness and rapidity, and it reached an unusually low level before the com-

mencement of the dirotic elevation, which latter was exceptionally large; the predirotic elevations, on the other hand, were but slightly developed. On auscultation, the tones of the heart were pure, but were louder than normal.

Sometimes during a paroxysm a sudden reddening of the face was noticeable, extending often to the neck and the thorax. In the areas mentioned, vivid red patches would suddenly make their appearance, disappearing more gradually after lasting a few minutes — this appearance was associated with a burning sensation of the affected areas. In some cases during the paroxysm there was an outbreak of perspiration on the head and the back.

Associated with these cardiac troubles of women at the climacteric we usually find a state of physical and mental disquiet; less common associations are, an incapacity for regular work, sleep uneasy and much disturbed by dreams, great general nervous irritability, or signs of passive congestion in various organs; occasionally there is oedema of the lower extremities; the urine remains free from albumen.

In most of the cases of this nature which came under my own observation, a certain plethora was noticeable; among women at the menopause, it was especially the well-nourished, powerful, sanguine individuals, that were liable to palpitation of the heart. Direct examination of the blood sometimes showed a very high haemoglobin richness — 110, 115, or even 120, as compared with a haemoglobin-richness of 93 in normal woman. Several of my patients presented the clinical picture of the plethoric form of lipomatosis universalis.

In all, during ten years, I observed 67 cases of paroxysmal tachycardia in climacteric women. The age distribution was the following:

36 years of age.....	1 woman
38 years of age.....	1 woman
39 years of age.....	2 women
40 to 45 years of age.....	37 women
45 to 50 years of age.....	28 women
Over 50 years of age.....	8 women

Five of the patients were unmarried, three were married but childless, the remaining 59 were parous women.

As a general rule, women live in great dread of all manifestations of bodily disorder during the menopause; those who become affected with paroxysmal tachycardia are exceptionally anxious, and regard themselves as threatened by a "stroke." This pessimistic view is however, by no means justified. These cardiac disorders may make their appearance some time before the menopause, they may persist throughout the period during which menstruation is

irregular, they may even endure for some time after the total cessation of the flow—but serious consequences of this climacteric tachycardia have never come under my observation. As regards treatment of the disorder, I have seen very favourable results from the following measures: The systematic employment of mild purgatives, combined with suitable dietetic and hygienic regulations (bland diet, regular and strenuous exercise, cold ablutions, and wet compresses surrounding the abdomen).

When we enquire regarding the cause of the tachycardiac paroxysms occurring at the menopause, we must first of all bear in mind that in the cases which have come under my own observation, the cardiac impulse was powerful, the pulse strong and well-filled, that signs of general vaso-motor disturbance (*ardor fugax*, etc.) accompanied the tachycardiac seizures,—hence we are led to infer that we have to do with a stimulation of the excito-motor nerve fibres, which would appear to be due to the climacteric changes previously described as occurring in the female reproductive organs. This view receives support from the fact that after oöphorectomy, when, as in the normal climacteric, atrophic processes occur in the internal reproductive organs, paroxysms of nervous palpitation are frequently observed. The same explanation applies to the fact that in women at the climacteric affected with these tachycardiac troubles, we frequently see in association therewith the symptoms of uterine dyspepsia.

But in addition to these local anatomical changes in the reproductive organs, to which an etiological role must be assigned in the production of climacteric tachycardia, the irritable state of the accelerator nerves must also depend in part upon that general nervous hyperexcitability which is so often a characteristic feature of the climacteric period in women, manifesting itself in manifold hyperaesthesias, hyperkinesias, neuralgias, and, in extreme cases, mental aberration. The sensory nerves are more irritable than in their normal state, so that every stimulus acting upon them evokes a greater central effect than heretofore, and upon this ensues an exaggeration of various reflex manifestations, which appear altogether disproportionate to the strength of the exciting cause; among these disproportionate reflex effects, is to be numbered the tachycardia just described.

But in addition to the causes of climacteric tachycardia already enumerated, we have to take into consideration the results of recent investigations concerning the organo-therapeutic employment of the chemical constituents of the ovarian tissue; it would seem that when at the menopause the ovaries undergo atrophy, so that their internal secretion is no longer poured into the blood, the resulting

alteration in the chemical constitution of that fluid gives rise to a disturbance of the vasomotor centre in the medulla oblongata.

In some cases, the tachycardiac paroxysms appear to be connected with the erotic excitement to which women are sometimes subject at the climacteric, voluptuous crises and ejaculation occurring; it is possible that in some of these cases masturbation plays a part.

A second group of cardiac troubles occurring in climacteric women consists of cases which are very common, but not often very severe. The cases in question depend upon the liability to an increased deposit of adipose tissue in the body at the time of the menopause, and in this connexion the plethoric form of lipomatosis universalis almost invariably predominates. It is a well-known fact that between the ages of 40 and 50 years women have an excessive tendency to obesity, and that even those women who have hitherto been extremely lean are apt to become quite plump at the climacteric period. Chiefly in consequence of this increasing obesity, there occurs in climacteric women a series of cardiac troubles of very variable intensity. If the deposit of fat is effected very gradually, and if the obesity does not become extreme, it is only after vigorous bodily exercise, such as fast walking or going upstairs, and after meals, that the patient is troubled with a little shortness of breath and moderate palpitation; appetite, digestion, and sleep remain usually unaffected in cases of this degree of severity. Definite attacks of cardiac asthma, and well-marked signs of cardiac insufficiency affecting the entire circulatory system, will very rarely occur in such persons.

It is an interesting fact, that the troubles which arise from fatty deposits around the heart are in general far less severe in climacteric women than they are in obese men of corresponding age. This may be due to the circumstance discovered by *W. Müller*, in the course of his investigations on the proportions of the human heart, that in the development of general obesity, the pericardial fat increases proportionately to a greater extent in the male than in female. But in my opinion the true explanation is to be found in the fact that variations in the amount of fat in the body are normally far more extensive in women than in men; at puberty, during pregnancy, and during lactation, extensive though gradually effected changes in the amount of adipose tissue in various parts of the body occur, so that experience has rendered the organism ready to adapt itself to the further changes that take place at the climacteric—above all, the heart has become competent to meet very various demands upon its powers.

Only in women who from youth onwards have exhibited a marked tendency to obesity, and in whom at the climacteric age such obesity

has become extreme, do the cardiac troubles attendant on the menopause become very severe. In such persons, palpitation and shortness of breath occur on slight exertion, and attacks of cardiac asthma are frequent. In consequence of the diminished propulsive power of the heart, circulatory difficulties make their appearance in the most widely divergent venous areas; the forms most commonly met with are, varices in the veins of the lower extremities, permanent dilatation of certain of the small superficial veins of the skin, phlebectases of the rectal veins (i. e. "piles"), and ultimately we see the well-known series of symptoms of venous engorgement—oedema of the feet, passive congestion of the lungs, albumen in the urine, etc.

When such cardiac troubles are present, the objective examination of the heart shows in the early stage no gross abnormality; at most the heart-tones seem somewhat weakened, with a moderate enlargement of the area of percussion-dulness, whilst the impulse is displaced a little outwards, and is weaker than normal. In some cases, however, a marked dulness on percussion over the sternum indicates an extensive deposit of fat in the mediastinal tissues. In the second stage of the fatty heart, when the symptoms have become more severe, we find a considerable enlargement of the area of cardiac dulness both in the vertical and the horizontal extent; the cardiac impulse is diffused as well as feeble. The sounds of the heart are usually pure but faint—in some cases they remain loud and clear. Exceptionally, a short blowing murmur is heard with the first sound; and sometimes this sound is reduplicated.

Whilst in the first stage the pulse is hardly abnormal, in the second stage, very various changes occur; often it is subdiastolic or diastolic in character.

In the great majority of instances, in these cases of cardiac disorder at the menopause, provided a suitable dietetic regimen is early adopted and perseveringly carried out, we may give a hopeful prognosis.

A third, less common but far more serious form of cardiac disorder occurring at the menopause, displays the well-known symptoms of cardiac failure. Those thus affected are usually slightly built, delicate women, who during the years of development suffered from chlorosis, who in adult life were troubled with anaemic symptoms, and in whom the menopause was ushered in by very severe losses of blood; sometimes, again, they are women who throughout their sexual prime have been accustomed to menstruate very abundantly, who have had numerous and severe deliveries, or who have had frequent miscarriages—it is in those who have thus been weakened by frequent and profuse haemorrhages, that the symptoms of cardiac failure ensue at the climacteric period. The women thus

affected also frequently suffer from palpitation of the heart; the pulse is abnormally frequent, small, low, and easily compressible, and sometimes intermittent or arrhythmical. The heart's action is weak and devoid of energy. The heart-sounds are usually obscure, and sometimes a systolic murmur is audible. The patients are short of breath and are subject to attacks of cardiac asthma, not infrequently associated with angina pectoris. In conjunction with these symptoms, we see signs of venous congestion: sudden attacks of coldness in the hands and feet, often also oedema of the feet; the urine at times contains albumen. The haemoglobin-richness of the blood is always notably diminished. I need not discuss in further detail the well-known symptoms of cardiac insufficiency, and I need only insist that when these symptoms are met with in women at the climacteric, it is of the greatest importance, alike from the prognostic and from the therapeutic standpoint, to make a careful examination of the reproductive organs, so as to determine the exact source of the recurrent bleedings which usually constitute the primary cause of the patient's sufferings.

In several cases of this kind, I found that the haemorrhages were due to a relaxation of the uterine tissues, and that this relaxation was itself referable to intrapelvic circulatory disturbances, dependent upon obstruction in the vena cava inferior, whereby the venous return from the pelvis was rendered difficult, and an engorgement of the uterine vessels was brought about.

In some instances of cardiac failure at the menopause, chronic inflammation within the pelvis is to blame for the menorrhagia upon which the cardiac failure depends. Often, again, the haemorrhages are referable to vasomotor influences, such as are liable during the menopause to affect various vascular areas. In other cases, the recurrent bleeding is due to retroflexion of the uterus, to prolapse of that organ, or to tumour, it may be myoma, polypus, or carcinoma.

Finally, during the menopause, more especially in women in whom menstruation has continued up to or beyond the fiftieth year, or in those who have given birth to a large number of children or have lived lives of severe bodily exertion, cardiac troubles may arise dependent upon arterio-sclerosis of the great vessels. The signs of such changes in the walls of the bloodvessels are clearly marked: the cardiac impulse is heaving, the second sound of the heart is accentuated; the pulse is full and large, usually giving a very powerful blow to the examining finger, whilst its sphygmographic tracing exhibits characteristic signs in the exceptional height and great distinctness of the first predicrotic elevation. The subjective troubles are in these cases very severe; dyspnoea and attacks of

asthma or of vertigo are common, and sometimes albumen may be found in the urine.

We may thus summarize the cardiac disorders met with at the menopause, and more or less directly dependent upon the changes undergone by the feminine organism at that period of life:

1. Paroxysmal tachycardia, a reflex neurosis due to the climacteric changes in the ovaries.

2. Nervous palpitation in women who were similarly affected at the time of the menarche, and in whom the trouble is merely the expression of a very unstable nervous system, and one influenced with especial readiness by impressions proceeding from the reproductive organs.

3. Cardiac disorder due to the obesity so commonly occurring as a part of the general metabolic changes of the menopause, but more particularly dependent upon a deposit of fat in the neighbourhood of the heart itself.

4. Symptoms of cardiac failure, due to excessive losses of blood at the menopause, either as an exaggeration at this time of menstrual processes, or as a result of some actual disease within the pelvis.

5. Cardiac disorder in women in whom the menopause occurs at an unusually advanced age, and dependent upon arteriosclerosis.

Particular consideration must be given to a symptom not infrequently occurring in association with the cardiac troubles of climacteric women, and referable to the circulatory disturbances characteristic of this period of life, namely, vertigo. The attack in some cases comes on without apparent cause, in others it occurs on the performance of some unusual movement or the adoption of some peculiar posture (stooping, or the like); the patient is suddenly seized with a sense of rotation, either of his own body, or else of his visible and palpable environment; with this is associated a sensation of disturbance of equilibrium, flickering before the eyes (*muscae volitantes*), tinnitus aurium, palpitation of the heart, increased frequency of the pulse, which may be either full or small, redness or pallor of the face, coldness of the hands and feet, muscular twitchings, a sense of great anxiety, and the outbreak of a cold perspiration. The vertigo occurs in paroxysms, usually of short duration—a few minutes to a quarter of an hour. It is especially plethoric and obese women who are liable at the climacteric to suffer from this disorder.

A somewhat similar condition is described by *Tilt* under the name of "pseudo-narcotism," as frequently occurring in climacteric women. *Tilt* indeed states that in 500 such women, he noted its presence in no less than 277.

Many hypotheses have been promulgated to account for the vertigo that so frequently occurs at the menopause. Both anaemia and hyperaemia of the brain have been assumed as causes, alike dependent upon the irregularity of menstruation, which is supposed to have a reflex influence upon the cerebral circulation. Others regard the vertigo as a climacteric neurosis, since it occasionally occurs before the menstrual irregularities begin, and in such cases a reflex disturbance of the cerebral circulation cannot be supposed to have arisen. According to *Matusch*, climacteric vertigo is a manifestation of epilepsy — an explanation which has been often extended to include all the menstrual psychoses. *Windscheid* believes that in many of the cases the vertigo is to be explained by the existence of arteriosclerotic changes in the blood vessels, such as are already by no means rare at the age at which the menopause usually occurs; whilst in other cases, he believes, the vertigo is to be regarded as one of the symptoms of a nervous disorder. That in any case the vertigo is dependent in some way upon the changes that occur in the reproductive organs at the climacteric period, is shown by the fact that after the final cessation of menstrual activity the patient as a rule ceases to suffer from this symptom.

To the circulatory disturbances consequent upon the menopause we must also refer *ardor fugax*, fugitive heat, the sudden rushes of blood to which women are prone at this period of life.

The cardiac troubles of the menopause are seen especially in women in whom the cessation of menstruation occurs quite suddenly, and in those in whom menstrual activity ceases at an exceptionally early age. It would seem that in such cases, owing to the continuance of periodic maturation of the graafian follicles associated with congestion of the intra-pelvic organs, in the absence of the periodic relief to that congestion afforded by the menstrual flux, there results a summation of stimuli, whereby the accelerator nerves of the heart are very powerfully affected.

Thus, I had under my care a lady from Smyrna 36 years of age. She had begun to menstruate when 12 years of age and menstruation was always scanty; she married when 15 years old, and finally ceased to menstruate when 19 years of age; she was sterile, and no abnormality could be detected on physical examination of her reproductive organs. Every month she suffered from severe paroxysmal tachycardia, with dyspnoea, rush of blood to the head, perspiration of the face, etc.

In another case, that of a woman 45 years of age, menstruation, hitherto regular, was suddenly suppressed, during the flow, in consequence of a severe fright. The next month the flow failed to appear at the usual time, but instead the patient was affected with severe cardiac distress, accompanied by sudden sensations of heat

in the face, palpitation of the heart, and vertigo; these symptoms lasted for several days, and since then have recurred at intervals of three or four weeks.

The cardiac troubles of the menopause are seen with especial frequency in women who were affected with similar disturbances at the time of the menarche. Experience clearly shows that a certain connexion exists between the manifestations that accompany the commencement of sexual activity, and those that accompany the decline and extinction of that activity; and a physician will rarely be mistaken if he bases on the fact that the general health was or was not seriously affected at the age of puberty, a prognosis that the course of the climacteric will be an unfavourable or a favourable one, respectively. In other words, in women whose nervous system is an unstable one, and in those with hereditary predisposition to the occurrence of cardiac disorder, the changes that take place in the reproductive organs both during the menarche and during the menopause, are likely during these vital phases to arouse reflex disturbances of the cardiac functions. The facts thus noted are analogous to those observed by *Potain*, who distinguishes a peculiar form of chlorosis, occurring in delicate individuals at the age of puberty, and, though apparently cured during the menacme, recurring in its primitive severity at the time of the menopause.

Again, women with a sanguine and erethistic temperament are more inclined to suffer from cardiac troubles at the menopause than women of a tranquil temperament and those endowed with an unimpressible nervous system.

Finally, elderly virgins, women who have for many years lived in chaste widowhood, sterile women, women who have married shortly before the menopause, or who at this time have recently been delivered, are all more inclined to the cardiac troubles of the climacteric period than women whose sexual life has been of a less abnormal character.

In the literature of the subject, we find numerous references to the fact that among the disorders of the climacteric, circulatory disturbances play a part. But a full and accurate account of these disorders is lacking alike in the literature of gynecology and in that relating to diseases of the heart — and this is true even of the most recent publications.

Among striking individual cases, one recorded by *Moon* may be mentioned here, a case of tachycardia consequent upon a sudden menopause: "In a woman 35 years of age the menses were suppressed owing to chill; the pulse-frequency increased from 80 to 200, without any apparent change in the heart or its valves; the symptom lasted for several days, when menstruation became once more established. and the pulse-frequency fell again to the normal.

Tilt expresses the opinion that the heart is but little involved in the disturbances of the climacteric, his experience coinciding with that of *Quain*. *Boerner* and *Glaevecke*, on the contrary, describe the heart troubles of the climacteric in terms very similar to those employed by myself.

A. Clément describes a peculiar form of disturbance of the functions of the heart at the climacteric period, to which he gives the name of *Cardiopathie de la Ménopause*, and of which he has seen four cases. The age of his patients varied from 46 to 50 years. They were all vigorous women, free from hysterical symptoms, and they had never suffered from rheumatism or from any functional disturbance of the heart. In all these cases the cardiac disorder occurred at a time of life when menstruation still continued, but had already become somewhat irregular. Usually the trouble in question makes its first appearance during the flow, or, if occurring independently of menstruation, becomes more severe at that time. Prior to the development of the actual heart symptoms, we observe for a time, two or three months it may be, signs of general exhaustion and weakness. Then occurs an attack of palpitation of the heart, rapidly succeeded by faintness, sense of precordial anxiety, and dyspnoea. During repose the patient does not usually suffer from any difficulty in breathing, but sleep is apt to be disturbed by paroxysms of palpitation and severe precordial anxiety. As the disease advances, dyspnoea is observed on the slightest exertion. Ultimately, the symptoms mentioned, palpitation, precordial anxiety and dyspnoea, become permanent, but are less severe when the patient is at rest. Constant now is also the feeling of weakness and faintness, which from time to time increases to actual syncope with complete loss of consciousness, and coldness of the entire surface of the body. Examination of the heart gives negative results. The cardiac impulse is a little stronger than normal; the cardiac rhythm may be either regular or irregular, but actual intermission of the beats does not occur. The heart-sounds are pure, there is no murmur; the first sound, if altered at all, will be stronger, not weaker than normal. Neither swelling of the jugular veins nor venous pulsation is to be observed. The most striking symptom of heart affection, indeed the only positive physical sign, is the great increase in the frequency of the heart's action, the pulse rate often being as much as 150 or 160 per minute, and in addition weak and somewhat variable in strength. At the outset of the disease, no oedema of the lower extremities is to be observed, and it only appears after three or four attacks. In all the patients the extreme pallor of the face is a striking feature. An increased quantity of urine is eliminated. The course of the disease is characterized by a series of suc-

cessive paroxysms, separated by periods of almost complete remission. At first, these remissions last for a month or two, but they gradually become shorter and shorter, whereas the duration of the attacks continually increases, until it is as much as seven or eight days. At this stage, disturbance of digestion ensues, the appetite is lost, and the general vigour declines. Recovery ultimately occurs, but very gradually. *Clément* refers the disease to a profound disturbance of the cardiac innervation through the sympathetic nerves, but believes that anaemia constitutes a contributory cause of the cardiac disorder.

Kostkewitsch has made observations regarding the influence of the climacteric upon previously existing heart-disease, and has thereby been led to conclude that the influence is unfavourable. The functional disturbances of the cardio-vascular apparatus which commonly accompany the menopause, readily lead, should organic heart-disease exist, to the onset of severe cardiac weakness, which may have a rapidly fatal termination. In 55.5% of the women who enter the climacteric period with organic disease of the heart, the menopause gives rise to a failure of compensation. Such failure of compensation is especially likely to occur in women suffering from valvular insufficiency; it is least probable in cases of arterio-sclerosis without valvular defect. The symptoms of defective compensation—dilatation of the heart, increased frequency of the pulse, arrhythmia cordis, etc.—are manifested especially during the menstrual flow.

Diseases of the Digestive Organs.

The congestions which, as we have already pointed out, constitute the pathological basis of the majority of the disorders of the climacteric, manifest themselves in the abdominal organs in the well-known form of plethora abdominalis, chronic venous congestion of the gastric and intestinal mucous membrane, hyperaemia of the liver, hyperaemia of the mucous membrane of the bladder, catarrh of the bladder, distension of the haemorrhoidal veins, and the various symptoms dependent upon these several forms of congestion.

Bleeding from the haemorrhoidal veins and chronic diarrhoea are two of the troubles proceeding from the above mentioned congestion of the intra-abdominal vessels, which occur so frequently during the climacteric period that since the days of antiquity they have been regarded as critical manifestations of the menopause, the object of which is to afford a vicarious outlet for the menstrual flux, now become irregular and intermittent. It can, indeed, be readily understood that a discharge of blood and an increased secretion from the mucous membrane of the lower part of the intestine may, if not too violent, exercise a favourable influence upon the congestive states

of the climacteric, by relieving the distension of the abdominal vessels — by a local blood-letting which regulates the disordered circulation. In this way, even though we have ceased to regard it as a "critical" manifestation, hæmorrhoidal bleeding, accompanied by an increased secretion from the intestinal mucous membrane, may at the climacteric period have a distinctly favourable influence upon a woman's general condition.

Hippocrates already in his aphorisms pointed out the salutary effect of epistaxis and of diarrhoea in women suffering from suppression of the menses. Other authors have assigned a critical significance to diarrhoeas occurring at the climacteric, and have warned against their suppression. According to *Tilt*, diarrhoea occurred in 12% of all women of this age coming under his observation; in 4% of the climacteric women, this diarrhoea recurred at regular monthly intervals, whilst in 8%, the recurrence was irregular. In 500 women during the climacteric age, *Tilt* observed the following abdominal disorders:

Swollen hæmorrhoids in.....	62 cases
Diarrhoea in	60 cases
Enduring disturbance of the biliary secretion in.....	56 cases
Bleeding hæmorrhoids in	24 cases
Intestinal hæmorrhages in.....	20 cases
Icterus in	6 cases
Hæmatemesis in	4 cases
Monthly intestinal hæmorrhages in.....	2 cases
Monthly bleeding from hæmorrhoids in.....	1 case

In my own observation, constipation is more frequent in climacteric women than diarrhoea, the constipation being also a symptom of abdominal congestion. Sometimes, when diarrhoea occurs, it is really secondary to constipation. The accumulation of the faecal masses stimulates the intestinal mucous membrane, and gives rise to a profuse aqueo-mucous secretion; the firm faecal masses are then liquefied, the intestinal wall is lubricated, and the constipation gives place to diarrhoea lasting perhaps for several days. This is the explanation of many cases in which there is a periodic recurrence of diarrhoea.

Dyspeptic disturbances are rarely absent during the climacteric period. Most often we see disordered appetite, sluggish digestion, pyrosis, eructation, at times nausea and retching, and actual vomiting of a watery or bilious fluid. Occasionally, an abnormal sensation of hunger follows each meal, associated, however, with a feeling of distension of the stomach. A very distressing symptom is an excessive formation of gas within the intestine. At times such meteorism is extreme, and it then gives rise to very severe abdominal pain. The gas is evacuated slowly and with difficulty, the patient is compelled to loosen all her clothing; more especially after

a meal she is compelled to take off her stays and undo all the bands of her petticoats and skirt. At the same time we see difficulty in breathing, and tachycardia. Such an accumulation of gas within the abdomen may give rise to serious errors in diagnosis, the swelling being attributed to pregnancy or to abdominal tumour.

Noteworthy also at the time of the menopause is the occurrence of vomiting, either as an isolated symptom, or in association with some other well-known climacteric disorder. When this vomiting is associated with some unmistakable form of excessive secretory activity (hyperhydrosis, etc.), we may readily suppose that the vomiting is due to undue secretory activity on the part of the gastric mucous membrane. An excessive production of gastric juice, perhaps altered in quality as well as quantity, combined with some other disorder of gastric innervation (hyperaesthesia, or hyperkinesia) will sufficiently explain the occurrence of the sometimes excessive vomiting, even though in many of the cases there may be no reason to suppose that there exists any primary stimulation of the vomiting centre. In other cases, however, it is probable that the trouble is really due to a primary disorder of that centre; and a careful study of the clinical features of the case will be needed to show how far there may be associated with this other disorders of gastric innervation (*Boerner*).

Disturbances of the biliary secretion, icterus of greater or less severity, are by no means rare manifestations of the abdominal congestion of climacteric women, and such disorders have also been regarded as vicarious processes originated by the cessation of the menstrual flux (*Aran, Bennet, Henoeh*, and others. *Frerichs* also has pointed out that with the cessation of menstruation at the climacteric we not infrequently observe swelling of the liver, which disappears when, after a considerable period, the menstrual flow recurs — a sequence of symptoms which may be repeated again and again for a considerable time.

Diseases of the Skin.

The most characteristic symptom of disorder of the skin met with at the climacteric period — one which, indeed, may be said to be never absent — is *ardor fugax*, fugitive heat; and scarcely less common is hyperhydrosis, an excessive secretion of sweat. Almost invariably, at the commencement of the menopause, women complain of a feeling of burning heat, rising up from the breast to the face; and if they are kept under observation we see from time to time a sudden redness of the face, and sometimes also of the neck and chest, associated with the outbreak of a thin perspiration. Moreover, in nearly all climacteric women, we notice an increased secre-

tion of sweat over the whole surface of the body, and at times this secretion is extremely profuse.

In association with these symptoms we often see the hyperaemic processes in the skin known by the names of erythema and roseola, taking the form of larger or smaller bright red patches, which are most frequently seen on the sides of the neck, the front of the chest, and the face.

In many women, at the menstrual periods, when the flow has become scanty or has already entirely ceased, we observe the occurrence of eczematous eruptions, which have for this reason received the distinctive name of climacteric eczema. In the majority of these cases, the eczema does not make its appearance until the regular menstrual flux has completely ceased to occur; and in the less common cases in which the flow persists after the climacteric eczema has begun, menstruation is rarely regular, but has begun to exhibit the variability and disorder characteristic of the time of the menopause. If the eczema comes on after the menopause is completely established, it usually appears in from six to twelve months after the cessation of the flow; but in some cases, the eruption appears very soon after the menopause, whilst in others, its onset may be delayed for as long as four or five years. Climacteric eczema is obstinate, and shows no tendency to spontaneous cure. With regard to the localization of the eruption, *Bohn* found that in three-fourths of the cases it affected the hairy scalp and the ears; *Rayer* and *Hebra* also state that the eczema of the menopause is most frequently seen in these two situations, whilst the next commonest site for the eruption is the face. As regards other parts of the skin, it is only that of the extremities that is ever affected by this disease, especially the hands and the fingers, less often the forearms or the backs of the feet; it never appears on the trunk. With regard to the types of eczema occurring in connexion with the menopause, we see almost exclusively the squamous and the weeping forms of the disease.

In general, at the climacteric period, the skin is extremely sensitive, and devoid of powers of resistance to outward noxious influences. Alternations of dampness and dryness or of heat and cold readily give rise to redness, infiltration, and the formation of scales and fissures of the skin; sometimes this occurs merely after cold ablutions. These acute stages of swelling, redness, and vesiculation of the skin, readily pass on into chronic and obstinate dermatitis.

Not infrequently, during the climacteric, as during the menarche, inflammation of the sebaceous glands occurs, acne, at times accompanied by seborrhoeic manifestations. In other cases, we see disfigurements of the face in consequence of vascular dilatations, especially on the nose and on the adjoining portions of the cheeks,

rosacea, in which disease also there is associated inflammation of the sebaceous glands. Another disorder of the skin of the face which is greatly dreaded by women at this time of life, owing to the unsightly appearance it produces, is the development of sinuous dilations of some of the superficial vessels, at times associated with connective tissue proliferation in the form of red or violet-coloured painless nodules.

An extremely distressing affection, and one which is especially apt to attack women during the change of life, is the previously mentioned pruritus genitalium. The itching is in some cases confined to the external genital organs, whilst in others it extends into the interior of the vagina; also it may pass backwards over the perineum, and on into the gluteal folds. In some cases, some local pathological condition will be found to account for the disorder: catarrh of the vagina or of the cervix uteri; displacements, inflammations, or new-growths of the uterus; anomalies of the ovary, the bladder, or the urethra. *Cohnstein* draws attention to a circular hyperplasia of the vaginal portion of the cervix, occurring during the menopause, and, "owing to the vascular dilation by which it is characterized, possessing close analogies with haemorrhoids;" the worst symptom of this affection is pruritus. That in these cases the pruritus is actually dependent upon the "haemorrhoidal hyperplasia" of the portio vaginalis, *Cohnstein* considers to be proved by the fact that, whilst local applications give no more than momentary relief to the itching, this symptom is completely relieved by the abstraction of blood from the cervix. But in addition to such cases as these, we have from time to time to deal with patients suffering from violent genital pruritus during the climacteric period, in whom we shall vainly seek for any local pathological changes, to the cure of which our therapeutic zeal may be directed. Analogy with some other disorders of the climacteric leads us to conclude that in these cases also we have to do with an idiopathic neurosis (*Boerner*).

The frequent recurrence of pruritus vulvae leads ultimately to the formation of nodules and papular eruptions.

Many authors state that they have observed the frequent occurrence of erysipelas during the climacteric period; others assert that furunculosis, prurigo, urticaria, and herpes zoster, are seen with especial frequency at this period of life.

Tilt, in his 500 cases of women at the climacteric age, made the following observations:

201, or 40.2%, suffered from heats and tendency to perspiration.

2, or 0.4%, suffered from monthly recurrence of periods of perspiration.

84, or 16.8%, suffered from profuse perspirations.

13, or 2.6%, suffered from cold sweats.

14, or 2.8%, suffered from dry heats (dry flushes).

186, or 37.2%, remained free from such attacks of heat or perspiration.

Krieger gives as an example of the "occurrence of new troubles" at the change of life, furunculosis; so also does *Boerner*. "The discolouration of the face, occurring usually in connexion with pregnancy or with diseases of the reproductive organs, and known as chloasma uterinum, has been seen by *Cohnstein*, during the climacteric period, "chiefly in cases in which, owing to some degree of failure of general nutrition, the skin has been thrown into folds." *Wilson* regarded prurigo and eczema as the commonest skin-diseases of the climacteric period; whilst *Boerner* draws attention to a connexion between climacteric conditions and the outbreak of herpes zoster.

Disorders of Metabolism.

Among the disorders of metabolism to which women are especially prone at the climacteric period, we must in the first place allude to obesity (*lipomatosis universalis*), and to gout (*arthritis urica*).

Numerous observations have shown us that the time of the change of life, the period between the ages of 40 and 50 years, is the one especially favourable in women to the extensive deposit of fat in the tissues.

In 200 cases of great obesity (*lipomatosis universalis*) in women, in which I instituted enquiries regarding the age at which an excessive deposit of fat in the tissues had first been noticed, I obtained the following results:

In early childhood in.....	19 cases
At the age between 15 and 20 years in.....	30 cases
At the age between 20 and 30 years in.....	45 cases
At the age between 30 and 40 years in.....	52 cases
At the age between 40 and 50 years in.....	54 cases
At ages over 50 years.....	0 cases

We learn from these figures that it is between the ages of 40 and 50 years that there is the greatest tendency in women for the accumulation of fat; but that as early as between the ages of 30 and 40 years this accumulation may in many instances begin. Speaking generally, there is in women an obvious connexion between the development of obesity and the state of the reproductive functions, inasmuch as at puberty, during the puerperium, and above all at the climacteric, there is a special tendency to the accumulation of fat in the subcutaneous tissues. At the commencement of the meno-

pause, it is more especially in the abdominal wall, the breasts, and the buttocks, that we witness the deposit of fat. In the abdomen, owing to the thickening of the subcutaneous tissues and of the great peritoneal folds — especially of the great omentum — a marked protrusion occurs, whilst the umbilicus becomes more deeply hollowed, and ultimately funnel-shaped. In some instances, the deposit of fat around the navel favours the occurrence of umbilical hernia. After an artificial menopause, induced by oöphorectomy, it has also been noticed in from 42 to 52% of the cases that a marked general deposit of fat has occurred, affecting especially the breasts and the buttocks.

This obesity in climacteric women, not only impairs to a serious extent their good looks, but brings in its train a number of troubles, and gives rise to manifold morbid manifestations, and among these, changes in the heart, which may readily threaten the patient's life. In consequence of extensive fatty deposits in the myocardium, associated with actual fatty degeneration of the muscular fibres, cardiac insufficiency ensues, with all its distressing and disastrous consequences. It is further necessary to insist upon the fact that obesity during the climacteric very definitely favours the occurrence of menorrhagia.

On examining 282 women, 5 years after the complete cessation of the menstrual flow, *Tilt* found that

121 had become stouter than before,
71 were unchanged in this respect, and that
90 were thinner than formerly.

Alike in the third class and in the first were a very large proportion of women in whom the change of life had entailed much illness and suffering; but in the first class, the women who had been thus affected had at that time lost weight, and only in the latter half of the climacteric period, when their troubles had become less severe, had the condition of embonpoint made its appearance.

Passing now to the consideration of arthritis urica in women at the climacteric, it is worthy of mention that *Hippocrates* was so much struck by the association that he went so far as to deny that gout occurred at all in women before the menopause. The fact of the matter is that whilst women are in general less disposed than men to the occurrence of gout, the tendency of women to this disease during the climacteric period is so marked, that at this epoch of life the disease is far more common in women than it is in men of corresponding age.

It is in obese women, with a soft, white, and lax integument, with a pallid, somewhat bloated countenance, a poorly developed muscular system, extensive varicosities of the veins of the legs, marked

dyspeptic troubles, and habitual constipation, that during the pre-climacteric and climacteric periods, gout is especially apt to make its appearance. It is then characterized by the following symptoms. From time to time the woman suffers from tearing or shooting pains in the joints, lasting at first a short time only, and returning after longer or shorter intervals. With the frequent return of the pains, the affected joints become swollen; and finally the patient suffers from the characteristic attacks of acute gouty arthritis, with the well-known consecutive symptoms of this affection.

According to the observations of *Geist*, during the climacteric period, 28 women suffer from gout as compared with 4 men of corresponding age. *Tilt* publishes the following figures showing the mortality of women from gout in England:

At ages from 20 to 30 years.....	56 women
At ages from 30 to 40 years.....	121 women
At ages from 40 to 50 years.....	291 women
At ages from 50 to 60 years.....	152 women
At ages from 60 to 70 years.....	104 women

Regarding diabetes mellitus during the menopause, *Lawson Tait*, who maintained there was a distinct form of climacteric diabetes, asserted that this disorder of metabolism was less severe, and runs a longer course during the climacteric period than at other times of life.

Diseases of the Nervous System.

The disturbances of the nervous system that occur during the climacteric period, manifest themselves chiefly in the form of hyperaesthesia and hyperkinesia. The sensory nerves appear to me for the most part to be more irritable than normal, inasmuch as every stimulus by which they are affected arouses a comparatively greater sensation, and gives rise to an excessive reaction in the sphere of consciousness. The cutaneous hyperaesthesia of climacteric women is shown in very various ways, the commonest being the anomaly of sensation which gives rise to the symptom known as pruritus, characterized by paroxysms of itching in more or less extensive areas of skin, with consecutive nutritive changes in the affected portions of the integument. The commonest and the most distressing form of this disorder during the menopause is pruritus vulvae.

In addition to such manifestations of cutaneous hyperaesthesia, vasomotor disturbances of the skin are of frequent occurrence, characterized by redness, rise of temperature, and sometimes the formation of nodules in the affected areas. Almost without exception, at the outset of the climacteric period, and sometimes also

in the preclimacteric epoch, women complain of a very distressing feeling of fugitive heat in various portions of the surface of the body, manifested objectively by the rapid appearance and no less rapid subsidence of a red colouration of the skin of the face, the neck, and the chest. Such fugitive heats are due to disturbances of vasomotor innervation giving rise to sudden variations in the amount of blood passing through the vessels of the affected areas of skin.

Hardly less frequent during the climacteric are the sensations of imaginary movement which give rise to the subjective symptom known as vertigo. Often in women at this time of life it occurs quite without apparent cause, but in other cases on the performance of some unusual movement or the adoption of some unusual posture; there is a sudden perception of rotatory movement, either of the patient's own body or else of her visible and palpable environment. With this feeling of disturbed equilibrium, there is often associated optical and auditory hyperaesthesia, flickering before the eyes (*muscae volitantes*), tinnitus aurium, painful sensations in the head and more especially in the occipital region, nausea, vomiting, sense of anxiety, cold sweats, muscular twitchings, alternating redness and pallor of the face, and coldness of the feet. The vertigo occurs in paroxysms, usually of short duration, varying from one to fifteen minutes. It is especially in plethoric and obese women that climacteric vertigo occurs.

A peculiar form of this climacteric vertigo is that described by *Tilt* under the name of "Pseudo-Narcotism" of climacteric women, characterized by a sense of swimming movements, uncertainty in the gait, vacancy of expression, a confused look in the eyes like those of a drunken person, and a kind of mental stupor which the patient cannot shake off without considerable effort. The women thus affected state that they feel as if they had had too much to drink, as if something had gone to their heads; indeed their great fear is that they will be supposed to be intoxicated by those who see them walking in the streets; they feel even that they must refuse to receive the visits of their acquaintances if they wish to preserve their reputation for sobriety. They suffer also from great drowsiness, from a disagreeable sense of weight or pressure in the head, from a feeling "as if the brain was clouded, or needed to have some cobwebs swept away." They feel a disinclination to both mental and physical exertion, and their memory and all other intellectual powers are impaired.

Boerner maintains that the attacks of vertigo so frequently occurring at the menopause are in a minority of cases only dependent upon hyperaemic states (arising from the cessation of the menstrual flow); on the contrary, he believes that the cause more often lies

in hysteria, in chronic disorder of the digestive tract, or, finally, in anaemia. In his opinion, vertiginous attacks dependent upon cerebral anaemia are very common indeed during the climacteric period, and even for a long time afterwards; and he believes that their nature is often completely misinterpreted.

Another very unpleasant indication of disordered nervous function during the climacteric period is the sleeplessness that is so common at this time of life. Women who during the day time feel comparatively well, suffer at night, sometimes periodically at exactly the same hour night after night, from a state of general restlessness, and for this reason are unable to obtain the sleep for which they long. They throw themselves uneasily from side to side of the bed, or wander restlessly about the room, and before long, owing to this want of sufficient repose, become greatly depressed.

Among the neuroses of the sensory apparatus, the various kinds of cutaneous neuralgia are less common than during the menarche and the menacme; but on the other hand, in my personal experience at any rate, the visceral neuralgias are commoner, more especially cardialgia and hypogastric neuralgia. Of the superficial neuralgias, hemicrania and intercostal neuralgia are those which occur most often during the climacteric period.

During the change of life, hemicrania most commonly occurs in typical association with menstruation; or, if the flow has already ceased, the attacks of hemicrania recur at what should be the menstrual periods. This affection is characterized by the paroxysmal occurrence of a severe boring pain in the side of the head, more often the left side than the right, affecting the temporal, the parietal, or the occipital region, or the entire side of the calvaria at once, usually accompanied with redness and local rise of temperature of the painful part; the duration of the paroxysms varies in different cases from one or two to many hours; with the pain are associated chilliness, nausea, exhaustion, and a severe feeling of general malaise.

Of the intercostal neuralgias, one form deserves especial mention in this connexion: I refer to mastodynia, which is both physically and mentally one of the most distressing affections to which women are subject during the climacteric period. For a middle-aged woman suffering from mastodynia—the “irritable breast” of *Cooper*—almost invariably feels assured that these pains localized in the breast and its immediate vicinity are indications of a commencing cancer of the breast; and it is an exceedingly difficult matter, in most cases, to convince her that her fears are without foundation. In this manner, partly in consequence of the directly depressing effect of the pains, which are commonly intensely severe, and partly owing to the disturbance of mind produced by the belief

that an incurably fatal disorder has begun, I have in several instances seen cases of profound melancholia originate.

According to *Windscheid*, among the enduring painful sensations of the climacteric period, pains in the lower extremities are of somewhat frequent occurrence. Day after day the patient suffers from distressing tearing or lancinating sensations in the legs; the trouble is insusceptible of more exact description, but is none the less a very severe one. In addition to the lower extremities, the back, the spinal column, and more particularly the lumbo-sacral region, are often the seats of incessant pain. In the thoracic region of the back, the pain is usually diffuse; when confined to the spinal column, however, it is commonly limited to individual vertebrae, the spinous processes of those affected being also sensitive to pressure. The sacral pains may in some cases predominate to such an extent, that it is on this ground alone that the patient comes to seek medical advice. The sacrae is equally severe when the patient is standing, sitting, or recumbent; it often radiates into the lower extremities. *Boerner* draws attention to the fact that in many cases the pains in the sacrum or higher up in the back may be due to excessive tension of the abdominal parietes in consequence of the great accumulation of fat. Among motor manifestations, *Windscheid* draws especial attention to a certain degree of weakening of the muscles of the lower extremities. Although on examination no abnormality can be detected, fatigue and functional incapacity, more especially in the lower extremities, ensue in a manner altogether disproportionate to the exertion, so that the patient is most unwilling to take even a short walk, to go upstairs, etc. In pronounced cases, the patient will never go out walking without carrying a campstool, so that she can sit down to rest directly she begins to feel fatigued. In association with these disorders of motility we most commonly see the above-mentioned painful sensations in the legs, and by these latter the functional incapacity of the lower limbs is of course increased. Weakness of the arms is far less frequently observed; but occasionally we hear complaints that on the performance of domestic duties, needlework, etc., which previously could be carried out quite easily, the arms and hands are now speedily fatigued, and rendered functionally incapable.

Of the visceral neuralgias, cardialgia is by no means rare during the climacteric period; the pain is concentrated in the epigastric region, but not infrequently radiates to the back and to the chest. Hypogastric neuralgia is also not uncommon, pain in the lower part of the abdomen, associated with a sense of pressure in the bladder, the uterus, and the rectum, and sometimes radiating to the thighs and to the region of the haemorrhoidal nerves.

The opinion expressed by several authorities, that the menopause

favours the occurrence of cerebral apoplexy, must, according to *Windscheid*, be received with caution; we have to remember that with advancing years atheromatous changes are apt to occur in the cerebral arteries, and it is to these changes, altogether independently of the climacteric, that cerebral haemorrhage is due. It appears, however, to be a fact that the menopause favours the onset of progressive paralysis. According to *Jung*, 60%, and according to *von Krafft-Ebing*, 27%, of women affected with paralysis were first affected in this way during the climacteric period. *Von Krafft-Ebing* explains this occurrence by the fact that during the menopause fluxions of vasomotor origin are common, and these serve as the starting point of transudative processes.

Among the neuropathic manifestations of the climacteric period we must reckon the at times excessive increase of the sexual impulse. We have already insisted upon the fact that the sexual impulse is not normally extinguished in women at the time of the cessation of menstruation; on the contrary, sexual desire commonly persists long after the menopause, and on this fact is largely dependent the frequency with which elderly women espouse quite young men. But in some cases, the sexual impulse is enormously enhanced during the climacteric period, and the patient experiences paroxysms of intense voluptuous sensation, associated with manifestations of abnormal reflex and psychical reaction, with increased frequency of the pulse and the respiration, emotional excitement, it may be loss of consciousness, and even general convulsions. Some of these cases of disordered sexuality occur in those previously affected with pruritus vulvae et vaginae.

More particularly *Gueneau de Mussy* and *Boerner* have described cases of such excessive libido sexualis during the climacteric period, voluptuous crises with pollutions, occurring independently of any external cause; the women thus affected have a continued succession of erotic ideas, they experience an itching and burning sensation in the genital organs, and from time to time this culminates in a paroxysm of sexual feeling, with orgasm, and increased secretion from the glands of the vulva.

Boerner has observed that characteristic variations in the libido sexualis commonly occur at the climacteric period. Not infrequently at this time the sexual desire becomes greatly diminished in intensity, or even entirely disappears; more often, however, the desire persists throughout this epoch; finally, in many instances, the desire undergoes an increase, at times to a degree amounting to positive torment. The first of these changes, the decline in the intensity of the sexual desire, harmonising as it does with the general extinction of the sexual functions at the change of life,

might have been expected to be the normal occurrence. And it is a fact that in many cases characterized by an increase of libido sexualis at the climacteric epoch, *Boerner* found that there existed anatomical abnormalities in the reproductive organs (fibromata, flexions, etc.). Be this as it may, an increase in the intensity of sexual desire, as long as that increase is not altogether excessive, may be regarded as one manifestation of the visceral hyperaesthesias so general at this time of life. In the excessive degrees of this affection, however, those in which at times the sexual crisis is associated with general convulsions, we must, with *Romberg*, recognize the existence of a direct neuralgic state of the spermatic plexus. It is especially before the commencement of an actual menstrual period, or before a due period which fails to occur, that during the critical years complaint is made of this state of excessive sexual desire and sensibility; and in many instances the trouble begins at the very first appearance of the menstrual irregularities which foreshadow the menopause.

Windscheid draws attention to the fact that occasionally the nervous manifestations may make their appearance prior to the occurrence of any menstrual irregularity, so that it is by the nervous disturbance that the woman or her physician is warned of the approach of the menopause. "When the menstrual anomalies begin," continues *Windscheid*, "that is to say, at the commencement of the climacteric, the nervous troubles may have already attained their maximum and have begun to decline in intensity. As a general rule, however, the appearance of the nervous disturbances coincides with the commencement of the menstrual irregularities. It may happen that these disturbances are intensified with each recurring period, but this is not the rule. Sometimes, however, we may observe that when menstruation occurs with excessive frequency—a by no means rare phenomenon at the outset of the climacteric—the nervous disturbances become more severe; and especially is this the case when the unduly frequent flow is also abnormally profuse, as indeed often happens." The manifestations of climacteric neurosis occur, as *Windscheid* rightly insists, most frequently in the sphere of the psyche. "We observe a change in the disposition, which usually becomes more excitable. A woman previously calm and composed becomes irritable, inclined to emotional disturbance and to fits of temper, and unable to bear with equanimity the pinpricks so frequent in daily life, and especially in the daily life of a housewife. In other cases, however, the disturbance of the psyche is rather in the direction of depression: we observe a kind of spiritual inhibition, a deficiency of vital energy, an indifference to things which formerly gave pleasure.

Almost always, also, complaints of loss of memory are among the indications of such depression. To these intellectual anomalies are superadded disturbances of sensibility. There is excessive sensitiveness to bright lights, loud noises, and strong odours. Frequently, also, in such cases, we see great intolerance to alcohol, quite small doses giving rise to extremely disagreeable sensations in the head."

Climacteric Psychoses.

The powerful influence which the changes occurring at the climacteric period has in the origination of psychoses, has long been recognized, the menopause, in fact, being a favourable soil for the cultivation of mental disease. The fact is embodied in medical terminology, since many authors speak of "climacteric insanity," assuming that the psychoses of this period of life present a definite and characteristic clinical picture.

In an earlier part of this work it was shown that the process of menstruation has generally a marked effect upon the psyche, and that disturbances of menstrual activity are competent to exercise a pathogenic influence upon the mental condition of the woman who suffers from them; still greater and more intense is the influence of the cessation of menstrual activity, with its powerful and widespread disturbance of the entire organism, with its destructive oscillations of equilibrium in the spheres of sensation, perception, ideation, and volition. It is easy to understand how the rarer recurrence of menstruation, the occasional profuse losses of blood, the complete suppression of menstruation, the conditions peculiar to the climacteric period of stasis and congestive hyperaemia of the brain, are competent, more especially in hereditarily predisposed persons, to give rise to the development of psychoses; whilst in those already suffering from mental disorder, the menopause will be likely to bring about an aggravation in their symptoms. At this time of life, also, we have to take into account the effect of certain ideational influences to which allusion has already been made, the thought that womanhood and its joys are passing away for ever, and the fear of the dangers attendant upon this critical period of the change of life. A French proverb alludes to "le diable de quarante ans, si habille à tourmenter les femmes."

Mental disorder will be more likely to ensue at the climacteric period in those women whose nervous systems have always been unduly irritable, and in those affected with hereditary predisposition to insanity. Further, it is more likely to occur in those in whom the menopause takes place quite suddenly, in a catastrophic manner, than in those in whom the climacteric proceeds gradually, and

unaccompanied by any stormy manifestations in the organism at large.

It is not in my opinion possible to recognize any specific form of mental disorder peculiar to the climacteric period, but nevertheless the psychoses occurring at this time of life do exhibit certain striking and characteristic features, more especially in this respect, that states of mental depression with melancholia predominate, whilst erotic influences are manifest in their etiology. In the slighter forms, volition and ideation are unaffected, and the trouble manifests itself in the form of hypochondriacal moods, associated with bodily troubles. In more severe cases we see emotional depression, states of anxiety, limitation of the powers of conception and judgment, indecisiveness, low-spiritidness, and apathy; or on the other hand, restlessness, an inclination to continued moving about, the eager pursuit of continually varying occupations, loquacity, etc.; finally, if the mental disorder becomes still more severe, hallucinations, delirium, paroxysms of intense excitement, and in exceptional instances, fully developed mania.

As with regard to the other disorders attending the climacteric, so also in respect of the climacteric psychoses, women who have been or are married, who have had a reasonable number of children, and have been accustomed to a sufficiency of sexual activity, are more favourably situated, are far more immune, than women whose sexual circumstances have been the opposite of those mentioned, who have had one or two children only, who have indulged in intercourse only when protected from pregnancy by the use of preventive measures, or have remained sexually unsatisfied, and, finally, women who have never married, and those who for many years prior to the commencement of the menopause have lived in chaste widowhood. In "old maids," to the somatic effects of sexual abstinence (or in some cases of abnormal sexual gratification), are superadded the effects of the intellectual and emotional recognition of a wasted life. Again, it by no means rarely comes under our observation that women who in youth, at the time of the menarche, suffered from psychical disturbances, are apt once again to be affected with transitory mental disorder at the change of life. Once, however, the menopause is completely at an end, a condition of mental quiescence is as a rule established, and then it may happen that previously existent mental disorders undergo amelioration; but on the other hand we have in all cases to reckon with the possibility that they may take an unfavourable turn in the direction of the development of senile psychoses.

Of considerable interest is the fact, first pointed out by *Glaevecke*, and subsequently confirmed by other observers, that in cases of artificial menopause, melancholic mental disturbances not infre-

quently follow the operation, in some instances so severe as to lead to weariness of life and actual suicide; and in general, after the artificial induction of the menopause, psychical disturbances are by no means rare, and are sometimes very severe. Such disturbance of the mental balance is seen after oöphorectomy especially in women who are still comparatively young, and whose sexual powers are still in a ripe state; whereas when the operation is performed in women of a more advanced age, whose ovaries were already nearly or completely functionless, no psychopathic changes are likely to ensue. In women belonging to the former category, the same etiological influences come into operation as in the physiological menopause, the patient, that is, is affected by the psychical influences of the removal of the ovaries—not only by the cessation of menstruation and the disappearance of the internal secretion of the reproductive glands, leading to a disturbance of the physical equilibrium, but also by the intellectual recognition of the loss of sexual potency, and a consequent disturbance of the mental balance.

In *Schlager's* opinion the climacteric has a potent influence in promoting the development of psychical disturbances in women, even when the involution occurs at the normal age. The course of these disturbances is as follows: soon after the commencement of the process of involution, when for a few months already the menstrual periodicity has been irregular, or the flow has been unduly profuse, a change of disposition makes its appearance, at first hardly noticeable, but after a little time manifesting itself clearly in the form of an increase in irritability. The woman finds fault with everything and everybody, becomes mistrustful, suspicious, full of complaints, imagines that the most insignificant annoyances are due to intentional slights; at the same time she complains of continued sleeplessness, palpitation, various indescribable sensations, and of headache. Occasionally, congestions of the head occur, with alarming dreams, and the moodiness may increase greatly; in this condition three such patients of *Schlager's* were impelled to attempts at suicide. *Schlager* further draws attention to the fact that in 22 cases known to him in which suicide was performed or unsuccessfully attempted by women, in eleven of these the patient was at the climacteric age. He believes that the most important etiological influence in the production of climacteric mental disorder in such cases is the sudden suppression of menstruation. In the majority of these instances, the mental disorder takes the form of mania; exceptionally, however, the form of chorea or of catalepsy.

By *Tilt* the following forms of "climacteric insanity" are distinguished: delirium, mania, hypochondriasis, melancholia, impulsive insanity, and perversion of the moral instincts. The same

author publishes the following table showing the age incidence in 1,320 cases of mental disorder in women, from which it appears that during the age of the menopause, a very considerable number of the cases originate, but that after the change of life comparatively few cases occur.

In these 1,320 cases the women were:

Under 15 years of age in.....	9 instances
Over 15 and under 20 years in.....	61 instances
Over 20 and under 25 years in.....	216 instances
Over 25 and under 30 years in.....	223 instances
Over 30 and under 35 years in.....	217 instances
Over 35 and under 40 years in.....	218 instances
Over 40 and under 45 years in.....	162 instances
Over 45 and under 50 years in.....	153 instances
Over 50 and under 55 years in.....	122 instances
Over 55 and under 60 years in.....	57 instances
Over 60 and under 65 years in.....	55 instances
Over 65 and under 70 years in.....	27 instances

Fuchs tabulated the ages of 26,300 insane persons. Reducing his results to the ratios per 10,000, he obtained the following results:

	Women.	Men
At ages under 20.....	503	649
At ages over 20 and under 30.....	1,895	2,132
At ages over 30 and under 40.....	2,557	2,614
At ages over 40 and under 50.....	2,180	2,080
At ages over 50 and under 60.....	1,362	1,247
At ages over 60.....	1,443	1,278

According to *Esquirol*, among 198 women who committed suicide, there were 77 between the ages of 40 and 50 years—a number considerably larger than those in any other age-decade. Among 235 women suffering from dementia, a moiety had first come under treatment during the climacteric age. The same author published the following data regarding the age-incidence of insanity in the case of 6,713 female patients:

At ages under 20 years.....	348 cases
Between the ages of 20 and 25.....	563 cases
Between the ages of 25 and 30.....	727 cases
Between the ages of 30 and 40.....	1,607 cases
Between the ages of 40 and 50.....	1,479 cases
Between the ages of 50 and 60.....	954 cases
At ages above 60 years.....	1,035 cases

Matusch found that among 551 women suffering from mental disorder, there were:

At ages 0 to 10 years.....	9 cases
At ages 10 to 20 years.....	73 cases
At ages 20 to 30 years.....	140 cases
At ages 30 to 40 years.....	114 cases
At ages 40 to 50 years.....	107 cases
At ages over 50 years.....	38 cases

According to *von Krafft-Ebing*, among 858 insane women, there were about 60 in whom the disorder of the mind appeared to depend upon the influence of the climacteric, and in 25 of these there was hereditary predisposition to mental disease.

From *Kowalewski's* interesting work on the psychoses of the climacteric, we quote the following:

"In women, the climacteric has a distinct influence upon the mental life, and that influence is strongly manifested more especially in cases in which during the age of puberty mental disturbance had previously been noticed. The mental condition in which women approach the change of life is a very variable one, and it is one largely dependent upon the circumstances in which the active years of the sexual life have been passed. In some cases, a woman has been so fortunate as to marry early and from affection, and her whole married life has been passed without disturbance; her labours have not been exhausting, and her children have enjoyed good health; all have passed through the years of childhood without untoward incident, and their development has been a happy and successful one; in a word—everything has gone well with her and hers. Such a woman will give thanks to God for the rare felicity she has enjoyed; and quietly, patiently, and with understanding will endure the inevitable end of her sexual life. For such a woman, more especially if she comes of a healthy stock, the changes which occur in her reproductive organs at the epoch of the climacteric, need not entail any serious shock to her nervous system, nor need they form the culture ground for morbid manifestations in her nervous system or in her mind. Even if any anomalies in nervous working should occur, it will be such only as are aroused by the disturbance of the normal menstrual rhythm; in such cases, they will rarely prove of a serious or enduring character.

"But look, on the other hand, upon this picture. A woman has married without affection and from pure necessity. Her husband has been a drunkard, and rough and unfaithful. She has had a great many children, her labours have been tedious and difficult and accompanied with severe losses of blood. Some of the children fell sick and died; those that survived proved idle, good-for-nothing, and a burthen. The family life is dominated by quarrelsomeness, disorder, and insufficiency of means. The mother is affected with some chronic disorder of the reproductive organs, and is hardly ever out of the doctor's hands. After 25 or 30 years of a life of this kind, the woman enters upon the change of life. Physically exhausted, weary of life, never having known happiness, after an existence full of trouble and wretchedness, with nothing joyful either in her memories of the past or in her prospect of the future—the chief hope of such a woman is that her troubles

may soon end with her life. Where the soil is thus physically and mentally exhausted, the development of a neurosis or a psychosis is only too probable on the most trifling exciting cause. Her life seems of so little worth, that thoughts of suicide are likely to be very near at hand. Thus, when the climacteric alterations in the reproductive organs are superadded, melancholia is very likely to supervene. When, however, the case is complicated by hereditary predisposition to insanity, and by the occurrence of actual degenerative changes in the central nervous system, instead of the passive depression of melancholia, we shall rather see the ideas of persecution of paranoia. As an actual fact, these two psychoses, melancholia and paranoia, are the commonest forms of mental disorder at this period of a woman's life.

"These are the two extremes in woman's mental state at the time when the physical changes of the climacteric period begin in her reproductive organs. It will, of course, be readily understood that between these two extremes lies a series of combinations any one of which may in individual cases occur.

"The conditions of life during earlier years have thus a strong determinative influence in the production of mental disorder; and not infrequently in these conditions alone shall we find the efficient cause of the mental degeneration. At times, the memories of her own life have in a woman at the climacteric age so serious an effect, that these memories alone constitute the casual agent of the development of a psychosis, or at least so influence the soil as to make it a suitable culture-ground for the development of mental disorder, the actual exciting cause of the pathological state being a disturbance of the ordinary menstrual rhythm.

"In considering the mental condition of women at the outset of the climacteric period, we must not forget those who are called 'old maids.' In their youth these maidens also have had their ideals, their hopes, their plans, and their sorrows. They also had a natural impulse to love and to be loved in return; they hoped to become wives and mothers. But life has failed to fulfil their hopes and their wishes, and their longings have remained unsatisfied. Some of them have taken up their cross without murmuring, and have devoted their talents, their intelligence, and their love to the service of those nearest to them. But others make an active protest against fate in the form of vindictive feelings towards their environment, of quarrelsomeness, scandalmongering, etc. Here we see contrasted the two principal types of such women. On the one hand are those who devote their intellectual and spiritual powers to the service of society; these are unselfish sisters-of-mercy, untiring medical women, invaluable school-teachers and govern-

nesses, fanatical political agents, etc. Such as these have ceased to live for themselves. In the fullest sense of the words, they mortify the flesh, and guide their conduct by lofty moral principles. They have killed their sexual life, and they remain for ever virgins—both morally and physically. If, owing to a pathological inheritance, faulty conditions of life, exhausting illnesses, etc., a psychosis develops, the hallucinations and delusions from which they suffer very rarely assume a sexual character, nor are they of a degrading type. The sexual side of life seems, in fact, be they sane or insane, to have undergone complete atrophy. They suffer from simple melancholia with stupor, or their insanity takes a religious turn, but very rarely indeed has it an erotic character.

“Very different is it with old maids of the second type. They are dissatisfied with life, irritable, quarrelsome, envious, and malicious. They are spiteful and revengeful, gossips and scandal-mongers, boast of their own chaste and innocent lives, and never forgive any real or imaginary attempt upon their spotless virtue. At the same time they never lose hope for the future, and are full of imaginary love-affairs, in which they pass through scenes by no means chaste or innocent; they do not shrink from self-abuse and the abnormal gratification of the sexual needs, in which the lacking partner in the sexual act is supplied by the imagination. Under the influence of such abnormal conditions of life, these women frequently become affected by nervous disorders; migraine, neuralgia, cephalgia, nervous depression, rachialgia, debility, anaemia, diseases of the reproductive organs, etc. Thus, when they enter the climacteric age, the soil is fully prepared for the development of mental disorder, which in such individuals is often characterized by hallucinations of sexual sensation and perception, erotic visual and auditory hallucinations, delusions of similar character, increased sexual irritability, a search for abnormal means of sexual gratification, a propensity to obscene speech and conduct, etc.

“Mental disorder is so common during the climacteric period, that the term ‘climacteric insanity’ has now become established in the literature of mental alienation. In almost all the textbooks of the subject we find an allusion to this form of mental disease, but there is no real ground for *Maudsley’s* assumption that there is a climacteric insanity sui generis. At the climacteric, very various forms of mental disorder may occur—paranoia, melancholia, and mania; the only common feature in the attacks, owing to which they are classed as ‘climacteric insanity,’ being the fact that the final determining cause in each case is the onset of the change of life. In fact, this period is not without influence

upon the manifestation of the disease — its stamp is imprinted upon the clinical picture, it endues the disease with certain characteristic features — but still, the peculiarities common to the cases of mental disorder occurring at this time of life in women are not so great as to justify us in describing them as a separate variety of psychosis."

According to *Kowalewski*, this so-called climacteric insanity is met with in two principal forms: in many cases the mental disorder recurs in periodic paroxysms, associated either with the commencement of the menstrual flow, or having the periodicity of menstruation after the flow has already ceased to appear; in the other class of cases the psychosis has no direct connexion with menstruation, and is dependent upon the joint influence of all the manifestations of the climacteric period. Cases belonging to the former class have been distinguished by *Bartel* as "climacteric pseudomenstrual insanity."

The psychoses dependent upon the climacteric influences may, according to *Kowalewski*, appear in almost all the known forms of mental disorder: precordial anxiety, melancholia, mania, amentia, paranoia, etc.; and although they exhibit no features which are absolutely characteristic, or which, as already said, enable us to distinguish a specific "climacteric insanity," yet they all bear a common imprint by means of which we are enabled to detect in their causation the influence of this critical period of life. Thus, precordial anxiety occurs in paroxysms having a more or less regular periodicity, corresponding with that of the expected menstruation. The same feature is observable in the periodic exacerbations of hysterical and epileptic paroxysms. Often, also, there occur at this time sudden changes in the emotional disposition and in the character, in one direction or the other, without the development of actual melancholia or mania. The melancholia of the climacteric period occurs chiefly in married women, more especially in those whose circumstances are unhappy; and it is often manifested by attempts at suicide.

Mania is comparatively rare at the climacteric period; when it does occur, it commonly assumes a sexual form — sexual impulses, hallucinations, and delusions, and obscene conduct. Such manifestations are seen most often in widows, in "old maids" whose morals are not above reproach, and, speaking generally, in those whose sexual needs have remained partially or completely ungratified, and in those who have greatly erred in the conduct of this side of life. Amentia also occurs at this time of life; rarely in maniacal form, more frequently in association with menstruation as a periodic psychosis, or as a continuous disorder of mind with

exacerbations corresponding to the menstrual periods; it is often characterized by pronounced eroticism.

Much more frequent during the climacteric period is the occurrence of paranoia, as *Kowalewski* rightly insists. It is most often met with in "old maids" with psychopathic predisposition. The imagination of such individuals is always concentrated upon men; they imagine that men in general, but more particularly certain individuals of the opposite sex, are continually regarding them, making eyes at them, making signs to them, in some way or other striving to attract their attention. The most ordinary and invariable forms of polite intercourse are regarded by these women, whose powers of observation are morbidly stimulated, as being indications of a special "attention" paid to themselves. They persecute these men with their own attentions, and imagine that it is the men who are persecuting them. Often this morbid mental state is associated with sexual malpractices, masturbation, etc. Not rarely, such degenerates are affected with lascivious dreams. Often they experience hallucinations of sexual perception in the form of supposed assaults on their virginity. All these states are apt speedily to develop into a condition of general suspiciousness and ideas of persecution. The ideas of persecution assume a peculiar form, one especially characteristic of the climacteric period. The patients believe that a man, often personally unknown to them, and perhaps living in another town, enters into spiritual and bodily intercourse with them. These relations are supposed to be effected in most cases by means of spiritualism, hypnotism, or electricity. The patient importunes the man in question with letters, supposes herself to be legally united with him, and not infrequently wishes to give him the pleasure of paying her bills and providing her with money. It is a very common occurrence for a Catholic priest to be worried by such a woman, her delusion being grounded upon the fact that the priest is supposed to assume an exceptionally intimate spiritual relationship with members of his flock. The patient with ideas of persecution often herself becomes an actual persecutor, not only pestering her victim with innumerable letters, but in her jealousy making "scenes" whenever she can encounter him, and sometimes giving rise to serious scandal. With such a mental state we often see associated sexual hallucinations and delusions; the patient believes herself to be pregnant, imagines herself to have been violated, or to be living in carnal intercourse with a man—some one, it may be, with whom she is not even acquainted. Medical men are especially apt to suffer from the accusations of such women, whom they may have examined in private in entire ignorance of the patient's mental condition. Frequently, such ideas

of sexual persecution are associated with paroxysms of violent nymphomania, and in this way also the unwary physician may find himself placed in an extremely unpleasant position. It occasionally happens in such patients that abnormalities of the sexual instinct arise, and they begin to feel desire towards individuals of their own sex.

Such delusions of persecution by means of hypnotism, spiritualism, the telephone, etc., in association with sexual delusions and nymphomania, are so frequent during the climacteric period, that they may be regarded as preeminently constituting climacteric insanity. Frequently some old hysterical state underlies this form of mental disorder.

Thus these peculiar manifestations of eroticism must be regarded as the distinctive characteristics of climacteric insanity and more particularly of climacteric paranoia. A second characteristic of climacteric insanity is, according to *Garat*, the marked development of jealous emotions and delusions.

In addition to these fully developed psychoses, there occur in degenerates at the climacteric age paroxysms of impulsive insanity in the form of dipsomania, kleptomania, pyromania; exhibitionism; irresistible impulse to suicide, homicide, infanticide, etc. Such paroxysmal impulsive manifestations are, according to *Kowalewski*, commonly associated with menstrual disturbances; they occur most frequently at the due dates of menstruation when the flow fails to appear.

One hundred and sixty-nine cases of climacteric psychosis were classified by *Matusch* as follows:

Melancholia	36 cases
Mania	2 cases
Melancholia passing on into paranoia	28 cases
Melancholia passing on into secondary dementia	17 cases
Paranoia	43 cases
Neurasthenia during the climacteric period followed by mental disorder	19 cases
Neurasthenia prior to the climacteric period, followed by mental disorder during the climacteric period	10 cases
Apoplexy, cerebral abscess, dementia	6 cases
Epilepsy	2 cases
Alternating insanity	3 cases
Paralytic dementia	5 cases

Von Krafft-Ebing classified 60 cases of climacteric psychosis as follows:

Melancholia	4 cases
Alternating insanity	1 case
Acute delirium	1 case
Primary insanity:	
a. With primordial delirium	36 cases
b. Paralytic dementia	12 cases

The prognosis in cases of climacteric psychosis is regarded by *Kowalewski* as unfavourable; unfavourable vital conditions are associated with retrogressive metamorphosis of the tissues, hence mental disorder arising at this time of life is hardly less serious than that due to actual degeneration of cerebral tissues. Indeed, according to *Schüler* there is during the climacteric period an especial danger of the development of atrophic cerebral processes (Encephalitis atheromatosa) with apoplectic and epileptic seizures. *Schlager* also regards the prognosis of climacteric insanity as unfavourable; but *Merson*, on the other hand, observed among women suffering from climacteric psychoses a recovery rate of over 50%. On previously existent psychoses in women, the onset of the climacteric exercises in most cases an unfavourable influence, and very exceptionally only at this time do we observe the cure or remission of a chronic mental disorder to occur. *Kowalewski* has seen cases of chronic mania in which a cure was obtained at the climacteric period; a somewhat excessive excitability and inclination to violence remained, however, as vestiges of the former insanity. *Matusch*, keeping under observation 60 women affected with chronic mental disorder as they attained the climacteric period, noticed that in 14 instances the mental condition changed for the worse at this period, whilst in 13 the character of the mental disease underwent a change, excitement giving place to apathy and dementia. *Griesinger* had earlier pointed out that at the time of the cessation of menstruation there would occasionally occur amelioration, and even cure, of a previously existing chronic mental disorder; more often, however, the influence of the menopause was an unfavourable one, a hitherto changeable and irritative form of mental disease becoming transformed into chronic insanity with inalterable delusions, or into dementia. The course of mental disorder, such as melancholia, first making its appearance at the climacteric epoch, was also regarded by *Griesinger* as likely to be unfavourable.

HYGIENE DURING THE MENOPAUSE.

During the critical years of a woman's life it is the aim of hygiene to employ all the means available to counteract the changes in the circulation of the blood, the disturbances in the working of the nervous system, and the nutritive disorders, which are in various ways dependent upon the changes occurring in the reproductive organs during the climacteric period; its endeavour should be so to regulate the conduct of life in this epoch that the important episode of the gradual decline and ultimate extinction

of sexual productivity shall be effected with as few local troubles as possible, and as slight variations in the general condition.

By means of baths of various temperature, duration, mode of application, and composition, and by other selected hydrotherapeutic procedures, we are enabled during the disturbances of the menopause to exert upon the skin a powerful derivative influence, and in this way to diminish the passive hyperaemia of the uterus and the uterine annexa; by the same means we can exercise a sedative influence on the peripheral nerves and thus further upon the entire nervous system, whenever such measures are called for by the manifold indications of increased irritability; further, by the use of baths we can influence the circulation of the blood, we can increase the sudatory activity of the skin, and in various additional ways we can affect heat production and metabolism, thus modifying the processes occurring in the reproductive organs, making the conditions favourable for the absorption of exudations, and promoting a healthy tissue-change in the mucous membrane of the genital passages.

In climacteric women, the most usual indications are for the employment of water-baths at an indifferent temperature, 35 to 37° C. (95 to 98° F.), of moderate duration, 15 to 20 minutes, the bath being one of simple immersion, not of douche or affusion, and the temperature being kept constant by continuous inflow of a sufficient quantity of hot water. Such baths as these promote in a mild but continuously efficient manner the functions of the skin—so important during the climacteric epoch; and they lessen the almost constant tendency to perspirations and to the development of diseases of the skin (the commonest of which is climacteric eczema). The moderate degree of thermic stimulus exercised by baths at such an indifferent temperature leads them to have an equable sedative effect upon the nervous system, which is probably dependent upon an influence exerted through the intermediation of the sensory nerve-terminals in the skin; and this is most beneficial in lessening the increased general irritability, both spontaneous and reflex, so commonly manifested by the nervous system at the climacteric period. In women at this time of life, such baths are most useful in allaying the common cutaneous hyperaesthesias and neuralgias, and have a reflex influence also upon the visceral neuralgias and psychical hyperaesthesias.

In climacteric women suffering from abnormal sensitiveness to sensory impressions, to strong light and loud noises, or from painful sensations in the most diverse nerve areas; in those subject to palpitation of the heart after some trivial exciting cause; in those affected with cramp-like seizures in the pharynx, the oesophagus,

the stomach, and the intestinal tract; in women with distressing sensations of itching and burning in the reproductive organs, or in those in whom there is a great increase in the intensity of the sexual impulse—in all these common disturbances of the menopause, by the daily use of such immersion baths of water at an indifferent temperature, best taken immediately before retiring to rest, we shall often succeed in inducing both local and general repose, in diminishing the spontaneous and reflex irritability of the nervous system, and in inducing quiet and restorative sleep.

In other cases of disturbances of health during the climacteric period, however, more benefit may be derived from hot immersion baths, taken at a temperature well above blood heat, (37° C.— 98.4° F.) and lasting longer than the warm baths just described. These are indicated when we wish to increase the activity of the circulation through the skin, to give rise to hyperaemia of the superficial structures of the body, to stimulate powerfully the cutaneous nerves, to promote cutaneous perspiration—in short, to exercise a powerful derivative effect, to promote resorption, and to accelerate the general processes of tissue-change. This method of treatment is suitable for cases in which at the commencement of the menopause there are already pathological conditions of the reproductive organs, the morbid states being now aggravated by the processes of the climacteric—such conditions are metritis and endometritis, chronic inflammations of the intra-pelvic connective tissue and of the pelvic peritoneum; and one of the first aims of treatment must be to promote the softening and subsequent absorption of these inflammatory products. Again, in cases in which the climacteric troubles, dependent in part on increased general arterial blood-pressure, manifest themselves chiefly in the form of active congestions, fugitive heats, vertigo, etc., the employment of hot baths is likely to be most useful by leading to a notable enlargement of the cutaneous capillary blood-vessels and consequent lowering of arterial blood-pressure. Further, in cases of compensatory fluxes, periodic diarrhoeas, periodic leucorrhoea, following the suppression of the menstrual flow, in cases of vicarious haemorrhage (especially periodic epistaxis and periodical haemorrhoidal bleedings), the use of hot baths is often competent to restore the functional activity of the ovaries when this has undergone *premature* cessation. In addition, their use assists us in our endeavours to counteract excessive obesity and gouty disorders, diseases which tend especially to make their appearance in women at the epoch of the menopause, disorders of metabolism intimately associated with the disturbances of the uterine and ovarian functions characteristic of the change of life.

In all the conditions just enumerated, if we desire a still more powerful influence than that exerted by ordinary hot baths, it is in our power to employ hot mineral water baths, by means of which a chemical, and perhaps also an electrical, stimulation of the cutaneous nerves is superadded to the simple thermic stimulus conveyed by the hot water. The different effects of the various mineral baths depends upon both the saline and the gaseous constituents of the different springs, and upon the peculiar physical properties of the mineral waters.

Sudorific baths are of various kinds. Some, Russian baths, consist of hot air saturated with moisture; others, Roman-Irish baths, consist of dry hot air; the most recent of all are the electric light baths, in which the radiant heat of electric lamps is utilized. But owing to the great increase in the body temperature which they cause, with consequent increased frequency of pulse and breathing, and still more on account of the rapid and extensive increase in blood-pressure to which they give rise, these powerful sudorific baths are rarely suitable for climacteric women, and if used at all in such cases the greatest caution must be employed. Their use is indicated only in women in whom at the time of the menopause the rapid onset of obesity has given rise to serious troubles, but in whom the heart is perfectly sound and in whom the blood vessels show no trace of sclerosis.

Far less often than warm or hot baths, or mineral water baths, are cold baths employed during the climacteric period, for baths at a temperature considerably below the indifferent point, and other hydrotherapeutic procedures in which cold water is used, stimulate the nervous system so powerfully and give rise to so great an increase in blood-pressure, that their use is generally to be avoided in climacteric women, since indeed it is apt to entail serious dangers both physical and mental. Immersion baths, plunge baths, or sponge baths, in which the water employed is at a temperature of 18° C. (64° F.) or less, are contraindicated, for they act too energetically, abstract heat too powerfully, to be safely employed at this epoch of life. If we seek by means of hydrotherapeutic measures to counteract states of congestion at the time of the menopause, and at the same time to bring about a general invigoration of the patient's nervous system, immersion baths the water of which is not below 20° C. (68° F.), and lasting from five to fifteen minutes, would appear to be indicated. In the majority of such cases, however, a somewhat higher temperature is preferable, from 26 to 28° C. (79 to 82° F.), the patient lying at full length in the bath, immersed to above the shoulders, and the water not being agitated except by a moderate rubbing of the surface of the body whilst the patient is in the bath. When, however, the

patient sits in the bath, the water covering only the lower half of the body as high as the navel, a somewhat lower temperature is permissible, 20 to 25° C. (68 to 77° F.); but the duration should not exceed five minutes, moderate mechanical manipulations being carried out meanwhile; such baths appear to reduce nervous irritability and to have a sedative effect in the manifold nervous disturbances of the climacteric period. Sitz-baths, again, of a longer duration, twenty to sixty minutes, the water reaching only to the navel, and being at a temperature varying from 16 to 25° C. (60 to 77° F.), are useful in relieving chronic inflammatory states of the reproductive organs and the associated erotic states and abdominal pain and irritability. Colder stiz-baths, even of brief duration, should, on the other hand, be avoided. Similarly, a shower-bath of water at a temperature of 18 to 24° C. (64 to 75° F.), lasting one to two minutes, and the water falling only from a very slight elevation above the head, have a valuable sedative action; but, on the other hand, a colder shower-bath, of water falling from a greater height, has an exciting action, and is to be avoided at this time of life. When there are severe congestive symptoms, friction of the hands and feet for a short time with water at a temperature from 12 to 17° C. (54 to 63° F.), followed by a quarter of an hour's rest in bed, may be recommended; also immersion of the feet for a minute in water at a temperature of 10° C. (50° F.), the feet being vigorously rubbed the while, followed by a walk in the open for five or ten minutes. In cases of sleeplessness at the menopause due to congestion, a useful method is to dip the feet for twenty or thirty seconds in water at a temperature of 8 to 10° C. (46 to 50° F.), the feet being briskly rubbed whilst in the water, or moved rapidly up and down with treading movements; after withdrawal, they are quickly dried, and the patient immediately goes to bed. Another useful mild soporific measure is to apply before going to bed bandages wrung out of cold water; these reach from the foot to the knee, and are left on for the whole night. In cases of climacteric menorrhagia, my vaginal refrigerator should be used for the direct application of cold to the reproductive organs; this is a cylindrical apparatus introduced into the vagina, cold water flows through the interior of the apparatus without wetting the vaginal mucous membrane. This cooling apparatus is useful also in troublesome cases of genital pruritus; cold douches to the vulva for one or two minutes at a time are likewise valuable in the relief of this affection.

For climacteric women, cold sea-bathing is as little to be recommended as other cold hydrotherapeutic measures, owing to its powerful refrigerative effect, and the great mechanical influence

of the moving water in the waves. But in certain cases, in which sea-air is likely to be beneficial, lukewarm sea-baths may also be recommended; their effect is similar to that of weak brine-baths at a similar temperature.

During the climacteric period, especial attention must be paid to the care of the skin. Owing to the extreme sensitiveness of the skin at this time of life to outward noxious influences, it is necessary to exercise great care to dry the skin very thoroughly after ordinary ablutions of the face and hands; irritating soaps should be avoided, and a bland powder should be applied after drying. During the earlier part of the climacteric period, when menstruation has already ceased, and senile changes in the skin with atrophy of the subcutaneous tissues have commenced, the extreme dryness of the skin may be relieved by lukewarm baths with wet packs to follow; after the bath, the woman is enveloped in moist linen cloths and then covered over all with a blanket. When the skin chaps readily, inunction of lanolin ointment will be found useful.

Cleanliness of the genital organs, at all times of importance, is doubly so during the climacteric period, for the reason that neglect in this respect is apt to lead to the onset of genital pruritus. Not only after defaecation, but after each act of urination as well, the external genital organs and the anus should be carefully washed over with a pad of clean absorbent wool moistened with lukewarm water. After the washing, either powder or ointment should be applied, the former in cases in which the skin of the parts is usually damp from a natural tendency to excessive secretion, the latter in cases in which the skin is dry and tends to crack.

Bodily exercise, carefully selected and regulated to suit the individuality of each patient, is a powerful means of relieving the disturbances of the menopause. Regular and methodical bodily exercise—to which it must be remembered, women at the climacteric period commonly feel considerable aversion—manifests its good effects in the form of improvement in the nutritive conditions and functional activity of all the organs, and increased activity of all metabolic changes, which are commonly sluggish in women at the change of life. Moreover, muscular exercise, by increasing the volume of blood passing through the muscles, has a beneficial derivative influence in diminishing the congestion of the brain and the other troublesome congestive symptoms which are liable to occur in women during the menopause. Again, in cases of excessive obesity such as so commonly occur in women at the change of life, the increased combustion of fat promoted by regular muscular exercise, cannot fail to have a beneficial effect. Finally, suitably selected muscular exercise has a favourable influence also

upon the nervous system, the functional activity of which it facilitates, while at the same time it strengthens the powers of the will.

It is therefore of importance that at the time of the menopause women should continue to undertake appropriate active exercise, regular daily walks, which should include walking up a moderate incline. As a preparation for such exercise (in persons hitherto unaccustomed to walk much), or in bad weather, or, again, when there are special reasons against open air exercise, and finally as a supplementary exercise to walking, gymnastics and massage may be employed. Such gymnastic procedures are to be chosen as will serve to deplete the vessels of the head, will have a favourable influence upon the portal circulation, and will withdraw the bloodstream from the pelvic organs; such are, in addition to general gymnastic exercises, methodical deep breathing, methodical exercise of the abdominal muscles, exercises involving the extensors of the back and the abductors and external rotators of the thigh, and exercises of the extremities. Various gymnastic apparatus may be employed with advantage, and more especially those in which the various muscular movements are effected against a resistance. But in all cases extreme care must be taken to avoid over-fatigue and over-exertion. A graduated form of bodily exercise combined with passive gymnastics, suitable for climacteric women, is massage, in which by mechanical stimulation, by pressure and friction of the whole body or of certain parts, the nutrition of the muscles is favourably influenced, and the activity of the general circulation is increased. In the use of massage also, in climacteric women, all undue excitation of the nervous system is to be carefully avoided, a mild form of this powerful agent must alone be employed; gentle stretching and rubbing of the skin of the lower extremities, the back, and the abdomen, followed by gentle kneading of the muscles. Massage of the internal reproductive organs (the method of Thure Brandt), in view of the common tendency to sexual excitability in women at the climacteric, is mentioned only to be prohibited. For the same reason, and also on account of the frequency with which at the time of the menopause women suffer from tachycardia and from other disorders of the heart, bicycling is in most cases an unsuitable exercise at this time of life.

A matter of great importance is the regulation of the diet of women during this phase of life, the aim of such regulation being one which the older physicians sought to fulfil by means of venesection and wet cupping, namely, to overcome the abnormality in the constitution of the blood which arises from the cessation of the internal secretion of the ovaries, and further to relieve the symptom-complex of abdominal plethora and the various passive hyperaemias and collateral congestions; and in addition to subdue

the great general nervous irritability, the sensibility to external stimuli, the inclination to excessive reflex manifestations, characteristic in women during the climacteric period.

The diet must be regulated in respect both of quality and quantity, and it is obvious that the regulation must be thoughtfully adapted to the needs of each individual case.

As regards quantity, the main general principle of dietetics for climacteric women is that over-nutrition is to be avoided, that the quantity of nutriment must be reduced to the absolute minimum necessary to supply the needs of the tissues. In view of the fact that we are concerned with women at a comparatively advanced period of life, whose physical labours are not as a rule exhausting, that quantity of food will usually be sufficient which is competent to furnish 35 to 40 calories per body-kilogram per diem. If we assume that the mean body-weight of a woman as the climacteric age is 60 kilograms, the heat-equivalent of the food required daily by such a woman may be estimated at 2,100 to 2,400 calories. This will be approximately supplied by a diet consisting of 100 grams albumen, 60 grams fat, and 350 grams carbohydrate. The customary preference for a large amount of nitrogenous food is, however, not dependent upon physiological requirements, and provided that the needful minimum of albumen is supplied (about 1.5 gram per body-kilogram per diem), the requisite number of calories may be furnished by very various combinations of the different nutritive elements.

The general principles of the qualitative regulation of the diet of climacteric women are: first that after the necessary minimum of albumen has been supplied, there shall be added an amount of carbohydrate and of fat varying in relative proportions and quantities according to the physiological requirements of the individual, but taken together sufficient to supply the necessary heat-equivalent; secondly, that there should be an abundant consumption of water; thirdly, that stimulating dietetic adjuvants should as far as possible be avoided.

The nitrogenous equilibrium of the body may be maintained either by animal or by vegetable proteids; in the case of the former (animal albumens), the climacteric woman should avoid those containing considerable quantities of nucleo-albumen or of deleterious products of tissue-change; in the case of the latter (vegetable albumens), she should avoid those likely to cause undue stimulation of the intestinal tract. Of flesh foods (mammals, birds, and fishes), those kinds are to be preferred which contain small quantities only of extractives (kreatin, xanthin, etc.) since these substances are supposed to have a stimulating influence upon the

nerves and the heart. Hence, boiled meat is better than roasted, and the flesh of young animals (veal, for instance) and fish are to be preferred to game, and the last-mentioned is to be avoided especially for this reason, that the flavours for which it is valued by the gourmet are products of partial decomposition arising from prolonged hanging; for similar reasons, meat extracts, animal soups, sausages, smoked flesh and fish, and preserved (potted) meats, should all be avoided. From the intimate connexion between the ingestion of nuclein and the formation of uric acid, albumens rich in nuclein are to be forbidden; such are the various foods consisting chiefly of gland-cells—sweatbread, liver, brain, kidneys, etc. As well as from the appropriate flesh-foods, the requisite albumen may most suitably be obtained from eggs and milk (including buttermilk); on the other hand, caviare is unsuitable owing to its stimulant action on the genital organs, cheese because it contains large quantities of the products of decomposition of casein and milk-fat; the fermented milks, koumiss and kefir, are likewise unsuitable. Suitable vegetable foods for the supply of albumen (in addition to carbohydrates) are porridge, bread, and the leguminosae; nuts, on the other hand, cause too much irritation of the stomach and intestines.

For women during the climacteric period we recommend a mixed diet moderate in quantity; the amount of flesh and fat in the diet should not be large, whilst cereals, green vegetables, and fruit may be taken in greater abundance; irritant vegetable foods must be avoided, and especially those which tend to stimulate unduly intestinal muscular activity and intestinal secretion. It is important that an abundance of water should be taken, not less than two or three pints daily, and a pure, fresh, spring water is preferable to the aerated waters, natural or artificial. Alcoholic beverages are to be avoided, and more especially those which are rich in extractives as well as in alcohol. For this latter reason, beer and champagne are harmful, whilst spirits and liqueurs are to be condemned on account of the high percentage of alcohol they contain. The stimulating alkaloidal drinks, tea and coffee, are also to be avoided, or if taken at all, only in a very dilute form. With regard to the preparation of the food, the cardinal principle is that it should be as little irritant as possible; neither mechanically irritating the alimentary tract by an excess of indigestible or undigested residue, nor irritating it chemically by an excessive admixture of sugar, salt, vinegar, pepper and other spices; nor, finally, giving rise to thermal irritation by being excessively hot or extremely cold.

The individual meals are preferably small ones and they must therefore be taken at comparatively short intervals, five times daily, the principal meal being taken at one or two o'clock in the after-

noon, and the supper (which should be small) comparatively early, at seven or eight o'clock.

NOTE.—In his discussion of the *details* of diet for women during the climacteric period, hours of meals, actual dishes, etc., the author refers exclusively to Austrian and German customs in these matters. The translator has not attempted to adapt the following pages to the needs of English readers, as he feels that the general principles already given will enable the English medical man to construct without serious difficulty suitable diet-tables for the cases with which he has to deal.

Suitable articles of food are the following:

Soups, Broths, and other Liquid Foods: Soups and broths made from the flesh or bones of beef, mutton, veal, chicken, or pigeon, *without* the addition of meat extract, or of meat juices, peptones, somatose or nutrose, but *with* the addition of barley, oatmeal, rice, wheatmeal, rye-meal, peas, beans, lentils, vermicelli, or macaroni; also broths or porridge made from any kind of ground cereal, or from potatoes, or from peas, beans, or lentils.

Flesh Foods: Lean beef, veal, mutton, roast or boiled, pigeon, chicken; certain fresh fish—pike, haddock, sole, perch, and trout. *Unsuitable* are: pork, goose, eels, salmon, herrings, oysters, caviare, lobster, crab, smoked meat, hare, vension, wild-duck, brain, liver, kidneys.

Vegetables, Sweets, and Savouries: Green peas, spinach, cauliflower, carrots, turnips, buttered eggs, omelette, boiled and baked puddings, rice boiled in milk, apples and rice, whipped cream, salads, wheaten bread, French rolls, biscuits, and rusks.

Fruits: Almost all fruits may be taken, raw, cooked, or preserved; also in the form of currant and other fruit cakes, and as fruit-ices.

Beverages: Milk, buttermilk, water, the same acidulated with various fruit-juices and essences (as lemonade, etc.), weak tea with plenty of milk, cocoa, chocolate. To be *forbidden* are: beer, strong and sweet wines, distilled spirits.

An example is subjoined of a simple diet-table compiled on the above principles:

	Quantity in grams.	Protein.	Fat.	Carbo- hydrate.
AFTERNOON:				
A cup of milk.....	150	5.4	5.4	7.5
Roll and butter.....	70	4.9	0.4	39.2
MIDDLE OF MORNING:				
Soup.....	100	1.1	1.5	5.7
Roll.....	70	4.9	0.4	39.2
MID-DAY MEAL:				
Soup.....	100	1.1	1.5	5.7
Roast meat.....	100	38.2	1.7	.....
Green vegetables.....	100	1.6	0.4	8.4
Pudding.....	200	17.4	30.0	57.8
Fruit.....	100	3.0	.....	15.0
Bread.....	35	2.4	0.2	19.0

	<i>Quantity in grams.</i>	<i>Albumen.</i>	<i>Fat.</i>	<i>Carbo- hydrate.</i>
BREAKFAST:				
A cup of milk	150	5.4	5.4	7.5
Roll	70	4.9	0.4	39.2
SUPPER:				
Soup	100	1.1	1.5	5.7
Two soft eggs.....	90	11.2	10.8	0.4
Bread	70	4.9	0.4	39.2
Fruit	100	3.0	.....	15.0
<hr/>				
Total	1,617	110.5	69.9	304.5
<hr/> <hr/>				

In addition, water, *ad libitum*, and perhaps a little light wine.

In many cases, however, a mainly vegetarian diet may be more suitable, and more particularly a mainly fruit diet, in order to diminish persistent congestive symptoms. In such cases the following diet-table may be recommended for *short* periods:

First breakfast: An apple and an orange.

Second breakfast: 25 grams of white bread with butter and three baked apples.

Dinner (mid-day): 100 grams fish or meat, potatoes, green vegetables, 3 boiled or baked apples.

Afternoon: An orange, or an apple, or a pear, or some grapes.

Supper: Milk, apples and rice, oranges, grapes, figs.

Beverages: Water, with or without fruit juices or essences.

Changes in the above diet-table could very readily be effected, whereby the quantity of carbohydrate could be increased and the quantity of albumen lessened.

In women of sanguine temperament and full habit of body, who at the time of the menopause very rapidly become obese, important changes in the diet become necessary. The main principles of a fat-reducing diet are the following: Avoidance of all over-feeding, reduction of the quantity of food taken below the former average amount, with retention, however, of a sufficiency of nutrient material to maintain the metabolic equilibrium of the essential tissues; the maintenance of this metabolic equilibrium demands a sufficiency of nitrogenous foods, but the fats in the diet may be reduced to a minimum, and the carbohydrates may also be very greatly diminished. At the same time, there must be systematic bodily exercise, and the hours of sleep must not exceed a nightly average of seven.

For obese women at the climacteric period, a suitable average diet would contain 160 grams albumen, 12 grams fat, and 120 grams carbohydrate, yielding a daily heat-equivalent of 1,250 to 1,300 calories.

A sample diet-table constructed on these principles is appended:

	<i>Quantity in grams.</i>	<i>Albumen.</i>	<i>Fat.</i>	<i>Carbo- hydrate.</i>
BREAKFAST:				
A cup of weak tea.....	150	0.45	.....	0.9
with milk, but no				
sugar	30	1.29	0.9	1.2
White bread	50	4.8	0.4	30.0
Lean cold meat	50	19.1	0.9	.....
DINNER (Mid-Day):				
Small cup of clear soup.	100	1.1	1.5	5.7
Lean beef	200	76.4	3.4	.....
Green vegetables, salad,				
etc.	100	1.6	0.4	8.4
Fruit	100	3.0	.....	15.0
Roll	35	2.4	0.2	19.6
AFTERNOON:				
A cup of weak tea.....	150	0.45	.....	0.9
With milk, but no				
sugar	30	1.29	0.9	1.2
SUPPER:				
Soup	100	1.1	1.5	5.7
Lean roast meat	100	38.2	1.7	.....
Roll	50	4.8	0.4	30.0
Total	1,245	155.9	13.2	118.6

In the selection of individual articles of diet, it is important to bear in mind the fact that in all climacteric women it must be our aim to stimulate intestinal muscular activity (peristalsis) and intestinal secretion to a moderate extent, for by more active intestinal secretion abdominal congestion is to some extent relieved, and by intestinal transudation and by diminution of the lateral pressure the circulation through the abdominal vessels is facilitated. By thus lowering the intra-abdominal blood-pressure, we shall assist in relieving a number of chronic hyperaemic states of the pelvic and various other organs, from which women are prone to suffer at the menopause. Hence all articles of diet must be forbidden which have a tendency to give rise to constipation. But we must also forbid all substances which leave extensive undigested residues, such as the rinds of fruits, large quantities of porridge, etc., hard meats, nuts, and the like. Most suitable are those articles of diet which contain large percentages of fluid constituents, such as milk, thin soups, weak tea (infused only a short time, so as to contain little tannic acid, which is very constipating), white meat—veal, breast of chicken, etc. Of vegetables, those are best which contain plenty of water and an abundance of the organic acids, young, fresh garden produce, lettuce, cauliflower, young green peas, young carrots, turnips, etc. Juicy fruits are good, apples, pears, cherries, and plums. Butter and honey are also excellent. In many per-

sons suffering from constipation, all that is necessary for their relief is to give a tumblerful of cold water the first thing in the morning; with others, the use in addition of whole-meal bread with plenty of butter and honey and uncooked fruit, is required.

In women suffering from the various disturbances of the climacteric period in an aggravated form, either because the menopause occurs at an unusually early age, or because the suppression of menstruation has taken place suddenly instead of gradually — especially in cases of heart-trouble, severe vertigo, pronounced vasomotor disturbances, or mental excitement (also erotic excitement), I have sometimes found a methodical milk-cure carried on for several weeks most beneficial. By this I do not mean an exclusive diet of milk, but a diet consisting chiefly of milk and milk-foods; owing to the absence of all irritation of the nervous and vascular systems, this diet has a very definite sedative influence in such cases. The milk should be skimmed, and should be given four times daily in gradually increasing quantities, the total amount rising from ten ounces to fifty ounces daily. The only other meal should be a substantial mid-day dinner, consisting of soup, roasted white meat, young green vegetables, and a little fruit. In some instances, to prevent constipation, it is necessary to add ten grams of milk sugar to each glass of milk; in other cases it is necessary to dilute the milk with water. It is obvious that the quantity of milk given is not alone sufficient to maintain the metabolic equilibrium of the body; but the defect in this respect is made up by the substantial meal given at mid-day.

Among the stimulating influences which during the sexual epoch of the menopause are as far as possible to be avoided we must unhesitatingly include the practice of coitus, inasmuch as at this time of life there already exists a strong tendency towards the occurrence of hyperaemia of the reproductive organs; and sexual intercourse, increasing as it inevitably must this tendency to hyperaemia, should be indulged in as little as possible. And yet precisely in women of the climacteric age, in "*la femme demi-vieille*" there often exists a strong desire to drain the cup of sexual pleasure to its dregs. Not infrequently, therefore, the physician is asked to advise regarding the proposed marriage of a woman in whom the menopause is drawing near, the desired husband being young, or at least still fully virile. If the advice is given in all sincerity with a sole eye to the woman's health, the medical man will definitely forbid the marriage.

When, however, the changes of the menopause are fully completed, when the woman's reproductive organs have undergone complete senile atrophy, there is no medical reason why a couple who wish to give a tenderer name to an intimate friendship be-

tween man and woman, should refrain from marriage — provided that both have attained a like stage of sexual decline. "But," writes *Tilt*, "a union between frosty January and blooming May is likely to be as dangerous to the health as it is to the happiness of both."

Whilst attending to the regulation of the physical diet of his climacteric patient, the physician should not overlook her psychical regimen. A woman's mind is very powerfully affected by the processes of the menopause. On the one hand, her fears are stimulated by the thought that she is entering upon the "critical age," of whose dangers she has often been warned; and, on the other hand, she is mentally depressed by the knowledge that she is about to lose the charms of womanhood, and to decline in sexual esteem. It is well, therefore, for women during the years of change, to have some kind of employment, which fills their hours, occupies their thoughts, and — leaves a certain scope for the exercise of feminine vanity. Works of benevolence or of general utility, and literary occupations, are thus of great advantage to climacteric women. *Plato*, indeed, pointed out that women at this time of their lives should occupy themselves with literature and intellectual culture.

Just as it is the duty of the physician, more especially of the family physician, to enlighten the maiden on the threshold of her sexual development regarding the processes of the awakening sexual life, and to give her the necessary instruction concerning the hygienic measures which it is proper for her to adopt — so also is it his duty to convey medical information to the woman who stands on the threshold of sexual decadence. A woman's ignorance is often equally profound at both these epochs of the sexual life. A woman in the early forties often does not suspect, or at least refuses to acknowledge, that she is gradually drawing near to the end of her sexual life; and she is still farther from the knowledge that definite rules of general and sexual hygiene must be observed by her if she wishes to minimize the dangers of the critical period.

The medical friend, in an earnest though far from gloomy manner, will expound to her the nature of the physiological processes of the menopause, and will instruct her regarding the corresponding preventive measures — diet, exercise, clothing, care of the skin, and the regulation of sexual intercourse. Moreover, the physician, by means of skilfully directed enquiries regarding certain symptoms, will be enabled to gain early information about the occurrence of abnormal processes at this period of life, and will in this way detect the first beginnings of many diseases which are amenable to treatment only at the very outset of their course. For example, *Brierre de Boismont*, an early and accurate observer of this sexual epoch in the life of woman, points out that in cases in which, during

the change of life, a woman experiences an increased inclination for sexual intercourse, nineteen times out of twenty, a local examination will disclose the existence of some disease of the reproductive apparatus. Similarly, every gynecologist is now familiar with the fact that unusually free, atypical haemorrhages during the climacteric period, are commonly indications of the existence of a uterine neoplasm.

Much evil may be avoided, and much suffering can be diminished if the physician, in accordance with the advice of Hippocrates, does not limit his activities strictly to the exercise of the healing art, but stands by a woman's side as her mentor and confidant during the troublesome years of her sexual decline. And he will best fulfil these functions, if he succeeds in convincing the climacteric woman of the profound truth embodied in the saying of the great French philosopher :

Qui n'a pas l'esprit de son âge,
De son âge a tout le malheur.

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